MOUNTAIN GREEN SEWER IMPROVEMENT DISTRICT

2023 BNR WASTEWATER TREATMENT PLANT

CONTRACT DOCUMENTS & SPECIFICATIONS

SUNRISE ENGINEERING

Prepared by:

SUNRISE ENGINEERING, INC.

6875 South 900 East
Midvale, Utah 84047

Tel: (801) 523-0100

Cliff Linford, PE

State of Utah,
Project Engineer
Date: January 2023

ADVERTISEMENT FOR BIDS

Mountain Green Sewer Improvement District
Morgan, Utah
BNR Wastewater Treatment Plant

General Notice

Mountain Green Sewer Improvement District (Owner) is requesting Bids for the construction of the following Project:

BNR Wastewater Treatment Plant
08242

Bids for the construction of the Project will be received at the Mountain Green Sewer Improvement District located at 5455 W. Old Highway Road Morgan, Utah 84050 until February 21, 2023, at 3:00 p.m. local time. At that time the Bids received will be publicly opened and read.

The Project includes the following Work:

- Draining of existing cell #2.
- Construction of 6,500 SF Operations Building (Smooth Face CMU).
- Construction of 5,000 SF Headworks Building (Smooth Face CMU).
- Installation of Biological Nutrient Removal Basin Equipment.
- Construction of (2) Clarifiers.
- Construction of a Large Digester Split Into (2) Sides.
- Electrical, Mechanical HVAC, and Plumbing.
- Chemical feed system: Two dual pump skid (4 pumps total), 1/2" tubing, 1/2" sch 80 PVC, 3" conduit, Pressure Gauges,
- Construction of Yard Piping including 6”-24” HDPE and Ductile Iron Lines, Sewer, Chemical Lines, Backwash Piping, Sludge Piping, Return Waste Water Lines, and Electrical System Upgrades including on-site back-up generator.
- Site Construction including import structural fill, asphalt paving, landscaping, and curb and gutter.
- Installation of Mechanical Dewatering System (Screw Press).

Bids are requested for the following Contract: BNR Wastewater Treatment Plant

~~[Or]~~

~~Separate Bids will be received for the following Contracts:~~

~~Contract No.~~	~~Description of Contract~~	~~Owner's Budget~~
~~[.]~~	~~[Name of Contract, e.g. General Construction]~~	~~$[Amount]~~
~~[.]~~	~~[Name of Contract, e.g. Electrical Construction]~~	~~$[Amount]~~
~~[.]~~	~~[Name of Contract, e.g. Plumbing Construction]~~	~~$[Amount]~~
~~[.]~~	~~[Name of Contract, e.g. HVAC Construction]~~	~~$[Amount]~~

Owner anticipates that the Project's total bid price will be approximately $19,000,000. The Project has an expected duration of 730 days.

Obtaining the Bidding Documents

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Information and Bidding Documents for the Project can be found at the following designated website:

https://planroom.sunrise-eng.com/#p/home

Bidding Documents may be downloaded from the designated website. Prospective Bidders are urged to register with the designated website as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through the designated website. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than the designated website.

~~The Issuing Office for the Bidding Documents is:~~

~~[Name of organization]~~
~~[Address where documents are available for viewing]~~

~~Prospective Bidders may obtain or examine the Bidding Documents at the Issuing Office on Monday through Friday between the hours of [insert hours], and may obtain copies of the Bidding Documents from the Issuing Office as described below. Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including addenda, if any, obtained from sources other than the Issuing Office.~~

~~Printed copies of the Bidding Documents may be obtained from the Issuing Office by paying a deposit of $[insert amount] for each set. Bidders who return full sets of the Bidding Documents in good condition within 10 days after receipt of Bids will receive a full refund. Non-Bidders, and Bidders who obtain more than one set of the Bidding Documents, will receive a refund of $[insert amount; often half of the initial deposit] for documents returned in good condition within the time limit indicated above. Make deposit checks for Bidding Documents payable to [entity name].~~

~~Bidding Documents may be purchased from the Issuing Office during the hours indicated above. Cost does not include shipping charges. Upon Issuing Office's receipt of payment, printed Bidding Documents or electronic documents on compact disk will be sent via the prospective Bidder's delivery service. The shipping charge amount will depend on the shipping method chosen. Bidding Documents are available for purchase in the following formats:~~

~~Format~~	~~Cost~~
~~Bidding Documents (including Full-Size Drawings)~~	~~$~~
~~Bidding Documents (including Half-Size Drawings)~~	~~$~~
~~Compact Disc containing Bidding Documents in portable document format (PDF)~~	~~$~~
~~Electronic download of Bidding Documents from [Hyper link to download site]~~	~~$~~
~~[Geotechnical or other informational documents, listed by title]~~	~~$~~

Pre-bid Conference

~~A pre-bid conference for the Project will be held on September 7th, 2022 at 3:00 PM at 5455 W. Old Highway Road • Morgan, Utah 84050. Attendance at the pre-bid conference is encouraged but not required.~~

A mandatory pre-bid conference for the Project will be held on January 24th, 2023 at 3:00 PM at 5455 W. Old Highway Road Morgan, Utah 84050. Bids will not be accepted from Bidders that do not attend the mandatory pre-bid conference.

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Instructions to Bidders.

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents.

This Advertisement is issued by:

Owner: Mountain Green Sewer Improvement District
By: Ian Hammond
Title: Project Manager
Date: January 2nd, 2023

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INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

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

A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—BIDDING DOCUMENTS

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

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

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

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

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

2.06 *Electronic Documents*

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

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 6 or later. It is the intent of the

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Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

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

~~C. After the Contract is awarded, the Owner will provide or direct the Engineer to provide for the use of the Contractor documents that were developed by Engineer as part of the Project design process, as Electronic Documents in native file formats.~~

~~1. Electronic Documents that are available in native file format include:~~

~~a. BNR Wastewater Treatment Plant~~

~~2. Release of such documents will be solely for the convenience of the Contractor. No such document is a Contract Document.~~

~~3. Unless the Contract Documents explicitly identify that such information will be available to the Successful Bidder (Contractor), nothing herein will create an obligation on the part of the Owner or Engineer to provide or create such information, and the Contractor is not entitled to rely on the availability of such information in the preparation of its Bid or pricing of the Work. In all cases, the Contractor shall take appropriate measures to verify that any electronic/digital information provided in Electronic Documents is appropriate and adequate for the Contractor's specific purposes.~~

~~4. In no case will the Contractor be entitled to additional compensation or time for completion due to any differences between the actual Contract Documents and any related document in native file format.~~

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, after submitting its Bid and within 7 days of Owner's request, Bidder must submit the following information:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract.

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

D. Subcontractor and Supplier qualification information.

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E. Other required information regarding qualifications.

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

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

ARTICLE 4—PRE-BID CONFERENCE

4.01 A mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Proposals will not be accepted from Bidders who do not attend the conference. It is each Bidder's responsibility to sign in at the pre-bid conference to verify its participation. Bidders must sign in using the name of the organization that will be submitting a Bid. A list of qualified Bidders that attended the pre-bid conference and are eligible to submit a Bid for this Project will be issued in an Addendum.

4.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

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

5.01 *Site and Other Areas*

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

5.02 *Existing Site Conditions*

A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

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

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

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

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

d. Technical Data contained in such reports and drawings.

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

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

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

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

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

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

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

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

5.03 *Other Site-related Documents*

A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, the following other documents relating to conditions at or adjacent to the Site are known to Owner and made available to Bidders for reference:

   1. Geotechnical Report

   2. Preliminary Engineering Report

   Owner will make copies of these other Site-related documents available to any Bidder on request.

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

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

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

E. No other Site-related documents are available.

5.04 *Site Visit and Testing by Bidders*

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

B. A Site visit is scheduled following the pre-bid conference. Maps to the Site will be available at the pre-Bid conference.

C. A Site visit is scheduled for January 24th, 2023 at 3:00 PM at 5455 W. Old Highway Road, Morgan, Utah 84050 Maps to the Site will be made available upon request.

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

E. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the following Owner or Engineer contact for visiting the Site: Ian Hammond, 918-381-8134, ihammond@sunrise-eng.com. Bidder must conduct the required Site visit during normal working hours.

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

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

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

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

5.05 *Owner's Safety Program*

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

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5.06 *Other Work at the Site*

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

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Express Representations and Certifications in Bid Form, Agreement*

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

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

ARTICLE 7—INTERPRETATIONS AND ADDENDA

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

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. All questions must be submitted by February 14th, 2023, at 5:00 PM. Contact information and submittal procedures for such questions are as follows:

A. Ian Hammond, ihammond@sunrise-eng.com

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

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

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid bond will be issued in the form included in the Bidding Documents.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract and

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furnish the required Contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited, in whole in the case of a penal sum bid bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

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

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

ARTICLE 9—CONTRACT TIMES

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

9.02 ~~Bidder must set forth in the Bid the time by which Bidder must achieve Substantial Completion, subject to the restrictions established in Paragraph 13.07 of these Instructions. The Owner will take Bidder's time commitment regarding Substantial Completion into consideration during the evaluation of Bids, and it will be necessary for the apparent Successful Bidder to satisfy Owner that it will be able to achieve Substantial Completion within the time such Bidder has designated in the Bid. Bidder must also set forth in the Bid its commitments regarding readiness for final payment. The Successful Bidder's time commitments will be entered into the Agreement or incorporated in the Agreement by reference to the specific terms of the Bid.~~

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

ARTICLE 10—SUBSTITUTE AND "OR EQUAL" ITEMS

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

10.02 ~~The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 10 days of the issuance of the Advertisement for Bids or invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's~~

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~~decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.~~

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

ARTICLE 11—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

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

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

A. All proposed subcontractors

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

11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 12—PREPARATION OF BID

12.01 The Bid Form is included with the Bidding Documents.

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

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

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 13—BASIS OF BID

13.01 *Lump Sum*

A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

ARTICLE 14—SUBMITTAL OF BID

14.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid

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security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

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

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

14.04 The following documents shall be included in the bid submittal:

A. Bid Form

B. Bid Bond Form

C. Addenda Acknowledge Form

D. Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion – Lower Tier Covered Transactions

E. Certification of Non-Segregated Facilities

F. Disadvantaged Business Enterprise Bidder Good Faith Effort Documentation

G. EPA Form 6100-3 – DBE Program Subcontractor Performance Form(s)

H. EPA Form 6100-4 – DBE Program Subcontractor Utilization Form

I. Subcontractor bidders list of all DBE and non-DBE firms that submitted a bid or quote to Bidder.

ARTICLE 15—MODIFICATION AND WITHDRAWAL OF BID

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

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

15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid,

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and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

ARTICLE 16—OPENING OF BIDS

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

ARTICLE 17—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 18—EVALUATION OF BIDS AND AWARD OF CONTRACT

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

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

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

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

18.05 *Evaluation of Bids*

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

~~B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.~~

C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.

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

~~E. For the determination of the apparent low Bidder when cost-plus-fee bids are submitted, Bids will be compared on the basis of the Guaranteed Maximum Price set forth by Bidder on the Bid Form.~~

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

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

ARTICLE 19—BONDS AND INSURANCE

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

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

ARTICLE 20—SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21—SALES AND USE TAXES

21.01 Owner is exempt from Utah state sales and use taxes on materials and equipment to be incorporated in the Work. (Exemption No. 11827932002). Said taxes must not be included in the Bid. Refer to Paragraph SC-7.10 of the Supplementary Conditions for additional information.

ARTICLE 22—CONTRACTS TO BE ASSIGNED

ARTICLE 23—SRF SPECIAL CONDITIONS

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BID FORM FOR CONSTRUCTION CONTRACT

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 1—OWNER AND BIDDER

1.01 This Bid is submitted to: Mountain Green Sewer Improvement District 5455 W. Old Highway Road, Morgan, UT 84050

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

ARTICLE 2—ATTACHMENTS TO THIS BID

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

A. Required Bid security;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

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

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

~~F. Required Bidder Qualification Statement with supporting data; and~~

~~G. [List other documents and edit above as pertinent].~~

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 Lump Sum Bids

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s), together with any Unit Prices indicated in Paragraph 3.02:

1. Lump Sum Price (Single Lump Sum)

Lump Sum Bid Price	$

The "Lump Sum Bid Price" reflects the total for all work required to complete all line items in the schedule of values. The Contractor shall be responsible for completing work given their lump sum price to the extent outlined in the drawings and technical specifications.

The contractors shall bid the project as a lump sum based on the schedule of values provided in the bid documents. The contractor shall include detailed costs for the items on the schedule of value for construction management purposes and comparison purposes.

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SCHEDULE OF VALUES

No.	Spec. Ref.	Description
GENERAL ITEMS		
1	02000	Mobilization
2	01400	Quality Control & Testing
3	02020	Subsurface Investigation
4	01571 SP	SWPP Plan & Implementation
5	02200	Site Dewatering Work
6	16000 SP, Div 40	Instrumentation and SCADA Controls
DEMOLITION & EXCAVATION		
7	02202 02206	Remove & Dispose Asphalt
8	02500	Remove & Dispose Power Pole
9	02500	Remove & Dispose Tree
10	02500	Remove & Dispose Irrigation Pipe & Appurtenances
11	02500	Remove & Dispose Electrical Conduit
12	02500	Demolish Existing Building & Surrounding Concrete
13	02500	Remove & Dispose Exist. Lagoon Aeration Equipment & Appurtenances
14	02500	Demolish Existing Chlorine Contact Chamber & Structures
15	02224	Furnish & Install Temporary Sewer Bypass
16	01510	Furnish & Install Temporary Utility Piping
17	02105 02201	Furnish & Install Excavation Earthwork
18	02105	Furnish & Install Temporary Shoring
SITE IMPROVEMENTS		
19	02511	Furnish & Install Asphalt Pavement
20	02511	Furnish & Install Concrete Pavement
21	15230	Furnish & Install Fire Hydrants
22	15230	Furnish & Install Yard Hydrants
23	03050 03100	Furnish & Install Retaining Wall
24	02105	Furnish & Finish Grade Earthwork
25	02810	Furnish & Chain Link Fencing and Gates
26	02511	Furnish & Install Road Base
PROCESS PIPING - MH#2 TO BNR.B		
27	02224	Furnish & Install 12" PVC SDR-35 Sewer Pipe
28	02224	Furnish & Install 18" PVC SDR-35 Sewer Pipe
29	02224	Furnish & Install 20" PVC SDR-35 Sewer Pipe
30	02224	Furnish & Install 24" PVC SDR-35 Sewer Pipe
31	02224	Furnish & Install 30" PVC SDR-35 Sewer Pipe
32		Furnish & Install Temporary Bypass Pumping
33	02224	Furnish & Install 60" Dia. Manhole

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34	03100 03200 15610SP	Furnish & Install 6’ x 6’ Concrete Box w/ Slide Gate Assembly
35	15321SP	Furnish & Install 12" Plug Valve Assembly
36		Furnish & Install Flo-Dar Meter Assembly
PROCESS PIPING - BNR.O TO CL		
37	02224	Furnish & Install 18" PVC SDR-35 Sewer Pipe
38	02224	Furnish & Install 24” PVC SDR-35 Sewer Pipe
39	15321SP	Furnish & Install 24" Plug Valve Assembly
40	03100 03200 15610SP	Furnish & Install BNR Outlet Box w/ Slide Gate Assembly
41		Furnish & Install Ultrasonic Level Transmitter Equipment
DECANT - CL TO POB		
42	02224	Furnish & Install 24" PVC SDR-35 Sewer Pipe
RAS/WAS - CL TO HOB; HOB TO RAS.J		
43	02224	Furnish & Install 18" PVC SDR-35 Sewer Pipe
44	15321SP	Furnish & Install 18" Plug Valve Assembly
45	02224	Furnish & Install 18” PVC C900 Sewer Pipe
EFFLUENT - POB TO MH EFF		
46	02224	Furnish & Install 24" PVC SDR-35 Sewer Pipe
47	02224	Furnish & Install 48" Manhole
48		Furnish & Install Flo-Dar Meter Assembly
DIGESTER PIPING		
49	02224	Furnish & Install 14" PVC C900 Sewer Pipe (WAS, HOB to ADG)
50	02224	Furnish & Install 10" PVC SDR-35 Sewer Pipe (Decant, ADG to MH#5)
51	02224	Furnish & Install 6" PVC C900 Sewer Pipe (Sludge, ADG to POB)
52	15321SP	Furnish & Install 6" Plug Valve Assembly
53	15321SP	Furnish & Install 14" Plug Valve Assembly
54		Furnish & Install 8” FRB Hobas Air Pipe
LOCAL SEWER MAIN & DRAINS		
55	02224	Furnish & Install 12" PVC SDR-35 Sewer Pipe
56	02224	Furnish & Install 48" Manhole
57	02226	Furnish & Install 6” PVC Drain Pipe
58		Furnish & Install 6” Wide Trench Drain Assembly
NON-POTABLE & POTABLE WATER MAINS		
59	02222	Furnish & Install 8" PVC C-900 Water Pipe
60	02222	Furnish & Install 3” PVC Sch. 80 Water Pipe
61	15234	Furnish & Install 1" Water Service Lateral
62	15234	Furnish & Install 1” Water Meters
63	15230	Furnish & Install 8” Gate Valve Assembly
64		Furnish & Install ½” Poly Tubing in 3” PVC Pipe (Alum Chemical)

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HEADWORKS OPERATIONS BUILDING		
65	04100	Construct CMU Building
66	15110 15219SP 02222	Furnish & Install Piping, Valves, & Meters (piping, valves, meters, couplers, supports, fittings, fasteners, etc.)
67	01000 SP	Install Owner Furnished Grit Chamber & Classifier Equipment
68	01000 SP	Install Owner Furnished Screw Press Equipment
69	01000 SP	Install Owner Furnished Blower Equipment
70	01000 SP	Install Blower Piping & Valves (piping, valves, supports, fasteners, fittings, etc)
71	01000 SP	Furnish & Install RAS/WAS Pumps
72	15225SP	Furnish & Install Chemical Equipment (storage tank, pumps, piping, eye wash station, etc.)
73	02222	Furnish & Install Hose Bib & Hose Rack
74	09911 SP	Furnish & Install Interior Pipe Painting (color coding & labeling)
75	15300	Install Sub-Floor Drainage Plumbing (floor drains, piping, etc.)
76		Furnish & Install Electrical & HVAC Equipment
77	01000 SP	Install Owner Furnished Screen Equipment
78		Furnish & Install Headworks Vault Equipment
PLANT OPERATIONS BUILDING		
79	04100	Construct CMU Building
80	15110 15219SP 02222	Furnish & Install Piping, Valves, & Meters (piping, valves, meters, couplers, supports, fittings, fasteners, etc.)
81	01000 SP	Install Owner Furnished Filtration Equipment
82	01000 SP	Install Owner Furnished UV Disinfection Equipment
83	01000 SP	Install Owner Furnished Blower Equipment
84	01000 SP	Furnish & Install Blower Piping & Valves (piping, valves, supports, fasteners, fittings, etc)
85	05100	Furnish & Install Grating & Supports (treadplate, floor grating, anchors, supports, etc.)
86	02222	Furnish & Install Process Water System (pumps, fittings, valves, filters, etc.)
87	12050 SP	Furnish & Install Restroom Funishings
88	12550 SP	Furnish & Install Lab Equipment & Furnishings (cabinets, countertops, refrigerator, dish washer, sink, oven, thermometers, filters, microscopes, etc.)
89	02222	Furnish & Install Hose Bib & Hose Rack
90	15300	Furnish & Install Sub-Floor Drainage Plumbing (floor drains, piping, etc.)
91	09911 SP	Furnish & Install Interior Pipe Painting (color coding & labeling)
92		Furnish & Install Electrical & HVAC Equipment

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BNR BASIN		
93	01000 SP	Install Owner Supplied BNR Equipment (piping, valves, chains, etc.)
94		Furnish & Install BNR Baffle Wall Equipment
95	02204 SP	Furnish & Install BNR Basin Liner
96		Furnish & Install 12" FRP Hobas Air Piping
CLARIFIERS		
97	01000 SP	Install Owner Supplied Clarifier Equipment & Appurtenances
98	03110 SP	Construct Clarifier Structure
99	02224 15321 SP	Furnish & Install Clarifier Piping, Valves, Fittings, Fasteners, etc.
100	02226	Furnish & Install Ring Drain System (piping, manholes, fittings, etc.)
AEROBIC DIGESTER		
101	01000 SP	Install Owner Supplied Digester Equipment & Appurtenances
102	03110 SP	Construct Digester Structure
103	02224 15321 SP	Furnish & Install Digester Piping, Valves, Fittings, Fasteners, etc.
104	15240 SP	Furnish & Install Floating Decanter Assembly

~~2. Lump Sum Price (Base Bid and Alternates)~~

~~Lump Sum Bid Price for Base Bid~~	~~$~~
~~Alternate A [Add] [Deduct]~~	~~$~~
~~Alternate B [Add] [Deduct]~~	~~$~~

~~3. Lump Sum Price (Sectional Lump Sum Bids)~~

~~Lump Sum Bid Price for Section I only~~	~~$~~
~~Lump Sum Bid Price for Section II only~~	~~$~~
~~Lump Sum Bid Price for Section I and II~~	~~$~~

~~B. All specified cash allowance(s) are included in the price(s) set forth below, and have been computed in accordance with Paragraph 13.02 of the General Conditions.~~

~~Lump Sum for Cash Allowance 1~~	~~$~~
~~Lump Sum for Cash Allowance 2~~	~~$~~
~~Lump Sum for Cash Allowance 3~~	~~$~~
~~Total for all Lump Sum for Cash Allowances~~	~~$~~

~~C. All specified contingency allowances are included in the price(s) set forth below, and have been computed in accordance with Paragraph 13.02 of the General Conditions.~~

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Lump Sum Contingency Allowance 1	$
Lump Sum Contingency Allowance 2	$
Lump Sum Contingency Allowance 3	$
Total for all Lump Sum Contingency Allowances	$

3.02 Unit Price Bids

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

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Amount
					$
					$
					$
					$
					$
Total of All Unit Price Bid Items					$

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 Work will be based on actual quantities, determined as provided in the Contract Documents.

3.03 Total Bid Price (Lump Sum and Unit Prices)

Total Bid Price (Total of all Lump Sum and Unit Price Bids)	$

ARTICLE 4—BASIS OF BID—COST-PLUS FEE

4.01 The Contract Price will be the Cost of the Work, determined as provided in Paragraph 13.01 of the General Conditions, together with the following fee, and subject to the Guaranteed Maximum Price.

4.02 Contractor's Fee

A. Contractor's fee will be [number] percent of the Cost of the Work. No fee will be payable on the basis of costs itemized as excluded in Paragraph 13.01.C of the General Conditions.

1. The maximum amount payable by Owner as a percentage fee (Guaranteed Maximum Fee) will not exceed $[insert cap amount], subject to increases or decreases for changes in the Work.

B. Contractor's fee will be determined by applying the following percentages to the various portions of the Cost of the Work as defined in Article 13 of the General Conditions. No fee will be payable on the basis of costs itemized as excluded in Paragraph 13.01.C of the General Conditions:

Costs	Percent
Payroll costs (See Paragraph 13.01.B.1, General Conditions)	
Materials and Installed Equipment cost (GC-13.01.B.2)	

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Amounts to be paid to Subcontractors (GC-13.01.B.3)	
Amount to be paid to special consultants (GC-13.01.B.4)	
Other costs (GC-13.01.B.5)	

1. The maximum amount payable by Owner as a percentage fee (Guaranteed Maximum Fee) will not exceed $[insert cap amount], subject to increases or decreases for changes in the Work.

C. Contractor's fee will be the fixed sum of $[number].

4.03 Guaranteed Maximum Price

A. The Guaranteed Maximum Price to Owner of the Cost of the Work including Contractor's Fee will not exceed $[Bidder fill in GMP].

ARTICLE 5—PRICE-PLUS-TIME BID

5.01 Price-Plus-Time Contract Award (Stipulated Price Contract)

A. The Bidder to which an award of the Contract will be made will be determined in part on the basis of the Total Bid Price and the total number of calendar days to substantially complete the Work, in accordance with the following:

	Description		Amount
A	1. Total Bid Price		$[number]
	2. Total number of calendar days to substantially complete the Work	[number] days	
	3. Liquidated Damages Rate (from Agreement)	$[number]/day	
B	4. Adjustment Amount (2 x 3)		$[number]
A+B	5. Amount for Comparison of Bids		$[number]

B. The purpose of the process in the table above is only to calculate the lowest price-plus-time (A+B) bid amount for bid comparison purposes. The price for completion of the Work (the Contract Price) is the Total Bid Price.

C. Bonds required under Paragraph 6.01 of the General Conditions will be based on the Contract Price.

5.02 Price-Plus-Time Contract Award (Cost Plus Fee with Guaranteed Maximum Price Contract)

A. The Bidder to which an award of Contract will be made will be determined in part on the basis of the Guaranteed Maximum Price and the total number of calendar days to substantially complete the Work, in accordance with the following:

	Description		Amount
A	1. Guaranteed Maximum Price		$[number]
	2. Total number of calendar days to substantially complete the Work	[number] days	
	3. Liquidated Damages Rate (from Agreement)	$[number]/day	
B	4. Adjustment Amount (2 x 3)		$[number]
A+B	5. Amount for Comparison of Bids		$[number]

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B. ~~The purpose of the process in the table above is only to calculate the lowest price-plus-time (A+B) bid amount for bid comparison purposes. The price for completion of the Work (the Contract Price) is based on the cost of the Work, plus a fee, subject to a guaranteed maximum price, as set forth in the Agreement.~~

C. ~~Bonds required under Paragraph 6.01 of the General Conditions will be based on the Contract Price.~~

ARTICLE 6—TIME OF COMPLETION

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

6.02 ~~Bidder agrees that the Work will be substantially complete on or before [Bidder inserts date], and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before [Bidder inserts date].~~

6.03 Bidder agrees that the Work will be substantially complete within 730 calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 750 calendar days, and before January 1st 2026, after the date when the Contract Times commence to run.

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

ARTICLE 7—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

7.01 Bid Acceptance Period

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

7.02 Instructions to Bidders

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

7.03 Receipt of Addenda

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 8—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

8.01 Bidder's Representations

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

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

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

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

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

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

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

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

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

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

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

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

8.02 Bidder's Certifications

A. The Bidder certifies the following:

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

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2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
    a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
    b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
    c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
    d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

_____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

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

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BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Bid**
Name: Mountain Green Sewer Improvement District	Project *(name and location)*:
Address *(principal place of business)*:	Mountain Green Sewer Improvement District, BNR Wastewater Treatment Plant, and 5455 W Old Highway Rd, Morgan, UT 84050
5455 W Old Highway Rd, Morgan, UT 84050	Bid Due Date: February 21, 2023 3:00 PM
Bond	
Penal Sum:	
Date of Bond:	

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

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

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

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

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BID BOND (DAMAGES FORM)

Bidder Name: Address *(principal place of business)*:	**Surety** Name: Address *(principal place of business)*:
Owner Name: Mountain Green Sewer Improvement District Address *(principal place of business)*: 5455 W Old Highway Rd, Morgan, UT 84050	**Bid** Project *(name and location)*: Mountain Green Sewer Improvement District, BNR Wastewater Treatment Plant, and 5455 W Old Highway Rd, Morgan, UT 84050 Bid Due Date: February 21, 2023 3:00 PM
Bond Bond Amount: Date of Bond:	

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

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

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

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder any difference between the total amount of Bidder's Bid and the total amount of the Bid of the next lowest, responsible Bidder that submitted a responsive Bid, as determined by Owner, for the work required by the Contract Documents, provided that:

    1.1. If there is no such next Bidder, and Owner does not abandon the Project, then Bidder and Surety shall pay to Owner the bond amount set forth on the face of this Bond, and

    1.2. In no event will Bidder's and Surety's obligation hereunder exceed the bond amount set forth on the face of this Bond.

    1.3. Recovery under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation will be null and void if:

    3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

    3.2. All Bids are rejected by Owner, or

    3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions will not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond must be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation		
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:			
	1.		
	2.		
	3.		
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?		☐ Yes ☐ No ☐ Pending	

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

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1.04 Provide information regarding the Business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

3.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

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ARTICLE 4—SAFETY

4.01 Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

4.02 Provide Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

5.01 Provide information regarding the Business's financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business's most recent financial statement:		☐ Attached
Date of Business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		

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ARTICLE 6—SURETY INFORMATION

6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	☐ Yes ☐ No		
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? ☐ Yes ☐ No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 7—INSURANCE

7.01 Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?		☐ Yes ☐ No	
Does provider have an A.M. Best Rating of A-VII or better?		☐ Yes ☐ No	
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

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ARTICLE 8—CONSTRUCTION EXPERIENCE

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business's previous contracting experience.

Years of experience with projects like the proposed project:				
As a general contractor:		As a joint venturer:		
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business's experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business's key leaders as well.

ARTICLE 9—REQUIRED ATTACHMENTS

9.01 Provide the following information with the Statement of Qualifications:

A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.

B. Diverse Business Certifications if required by Paragraph 3.01.

C. Certification of Business's safety performance if required by Paragraph 4.02.

D. Financial statements as required by Paragraph 5.01.

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E. Attachments providing additional information as required by Paragraph 8.02.

F. Schedule A (Current Projects) as required by Paragraph 8.03.

G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.

H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.

I. Additional items as pertinent.

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This Statement of Qualifications is offered by:

Business: _____
(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

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Schedule A—Current Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent		Safety Manager	Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent		Safety Manager	Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent		Safety Manager	Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

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Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

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Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

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NOTICE OF AWARD

Date of Issuance:

Owner: Owner's Project No.:

Engineer: Engineer's Project No.:

Project:

Contract Name:

Bidder:

Bidder's Address:

You are notified that Owner has accepted your Bid dated [date] for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

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

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

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

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

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

1. Deliver to Owner [number of copies sent] counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): [Describe other conditions that require Successful Bidder's compliance]

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

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

Owner: [Full formal name of Owner]

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Copy: Engineer

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AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between Mountain Green Sewer Improvement District ("Owner") and **[name of contracting entity]** ("Contractor").

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

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

- Draining of existing cell #2.
- Construction of 6,500 SF Operations Building (Smooth Face CMU).
- Construction of 5,000 SF Headworks Building (Smooth Face CMU).
- Installation of Biological Nutrient Removal Basin Equipment.
- Construction of (2) Clarifiers.
- Construction of a Large Digester Split Into (2) Sides.
- Electrical, Mechanical HVAC, and Plumbing.
- Chemical feed system: Two dual pump skid (4 pumps total), 1/2" tubing, 1/2" sch 80 PVC, 3" conduit, Pressure Gauges,
- Construction of Yard Piping including 6"-24" HDPE and Ductile Iron Lines, Sewer, Chemical Lines, Backwash Piping, Sludge Piping, Return Waste Water Lines, and Electrical System Upgrades including on-site back-up generator.
- Site Construction including import structural fill, asphalt paving, landscaping, and curb and gutter.
- Installation of Mechanical Dewatering System (Screw Press).

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: BNR Wastewater Treatment Plant

ARTICLE 3—ENGINEER

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

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

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

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

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~~4.02 *Contract Times: Dates*~~

~~A. The Work will be substantially complete on or before **[date]**, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **[date]**.~~

4.03 *Contract Times: Days*

A. The Work will be substantially complete within 730 days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within 750 days, before January 1st, 2023, after the date when the Contract Times commence to run.

~~4.04 *Milestones*~~

~~A. Parts of the Work must be substantially completed on or before the following Milestone(s):~~

~~1. Milestone 1 **[event & date/days]**~~

~~2. Milestone 2 **[event & date/days]**~~

~~3. Milestone 3 **[event & date/days]**~~

4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner $500 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $500 for each day that expires after such time until the Work is completed and ready for final payment.

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

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

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is

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precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

C. ~~*Bonus:* Contractor and Owner further recognize the Owner will realize financial and other benefits if the Work is completed prior to the time specified for Substantial Completion. Accordingly, Owner and Contractor agree that as a bonus for early completion, Owner shall pay Contractor $[number] for each day prior to the time specified above for Substantial Completion (as duly adjusted pursuant to the Contract) that the Work is substantially complete. The maximum value of the bonus will be limited to $[number].~~

~~4.06 *Special Damages*~~

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

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

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

ARTICLE 5—CONTRACT PRICE

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

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

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

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

~~Unit Price Work~~					
~~Item No.~~	~~Description~~	~~Unit~~	~~Estimated Quantity~~	~~Unit Price~~	~~Extended Price~~
				~~$~~	~~$~~
				~~$~~	~~$~~
				~~$~~	~~$~~
				~~$~~	~~$~~

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~~Unit Price Work~~					
~~Item No.~~	~~Description~~	~~Unit~~	~~Estimated Quantity~~	~~Unit Price~~	~~Extended Price~~
				~~$~~	~~$~~
~~Total of all Extended Prices for Unit Price Work (subject to final adjustment based on actual quantities)~~					~~$~~

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

~~C. Total of Lump Sum Amount and Unit Price Work (subject to final Unit Price adjustment) $[number].~~

~~D. 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 on the basis of Contractor's Applications for Payment on or about the 5th 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 the value of the Work completed (with the balance being retainage).

1) If 50 percent or more of the Work has been 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. 80 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by

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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, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 *Consent of Surety*

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

~~6.05 *Interest*~~

~~A. All amounts not paid when due will bear interest at the rate of **[number]** percent per annum.~~

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

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

1. This Agreement.
2. Bonds:
    a. Performance bond (together with power of attorney).
    b. Payment bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications as listed in the table of contents of the project manual (copy of list attached).
6. Drawings (not attached but incorporated by reference) consisting of 249 sheets with each sheet bearing the following general title: BNR WWTP 2022
8. Addenda (numbers **[number]** to **[number]**, inclusive).
9. Exhibits to this Agreement (enumerated as follows):
    a. Geotechnical Report
    b. Preliminary Engineering Report
10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.

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e. Warranty Bond, if any.

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

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

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

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

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

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

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

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

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

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

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

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

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

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

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

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

8.02 *Contractor's Certifications*

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

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

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

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

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

8.03 *Standard General Conditions*

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

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

This Agreement will be effective on **[indicate date on which Contract becomes effective]** (which is the Effective Date of the Contract).

Owner:	Contractor:
_____	_____
(typed or printed name of organization)	*(typed or printed name of organization)*
By: _____	By: _____
(individual's signature)	*(individual's signature)*
Date: _____	Date: _____
(date signed)	*(date signed)*
Name: _____	Name: _____
(typed or printed)	*(typed or printed)*
Title: _____	Title: _____
(typed or printed)	*(typed or printed)*
	*(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____	Attest: _____
(individual's signature)	*(individual's signature)*
Title: _____	Title: _____
(typed or printed)	*(typed or printed)*
Address for giving notices:	Address for giving notices:
_____	_____
_____	_____
_____	_____
Designated Representative:	Designated Representative:
Name: _____	Name: _____
(typed or printed)	*(typed or printed)*
Title: _____	Title: _____
(typed or printed)	*(typed or printed)*
Address:	Address:
_____	_____
_____	_____
_____	_____
Phone: _____	Phone: _____
Email: _____	Email: _____
*(If **[Type of Entity]** is a corporation, attach evidence of authority to sign. If **[Type of Entity]** is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	License No.: _____
	(where applicable)
	State: _____

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ARTICLE 23—SRF SPECIAL CONDITIONS

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REQUIRED POSTERS

Many of the required workplace posters can be found at **https://www.dol.gov/general/topics/posters/** The following posters required for the project, include but are not limited to:

1.	Minimum Wage Poster	**https://www.dol.gov/agencies/whd/posters/flsa**
2.	Davis-Bacon Wage Poster WH-1321	**https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/fedprojc.pdf**
3.	Davis-Bacon Wage Determinations	**https://sam.gov/search/?index=dbra&sort=-modifiedDate&page=1&pageSize=25&sfm%5Bstatus%5D%5Bis_active%5D=true&sfm%5BwdLocationWrapper%5D%5BwdStates%5D%5B0%5D%5Bkey%5D=UT&sfm%5BwdLocationWrapper%5D%5BwdStates%5D%5B0%5D%5Bvalue%5D=Utah&sfm%5BwdLocationWrapper%5D%5BwdCounty%5D%5B0%5D%5Bkey%5D=17775&sfm%5BwdLocationWrapper%5D%5BwdCounty%5D%5B0%5D%5Bvalue%5D=Morgan**
4.	Equal Opportunity Employer Poster:	**https://www.dol.gov/sites/dolgov/files/ofccp/regs/compliance/posters/pdf/eeopost.pdf**
5.	OSHA Poster	**https://www.osha.gov/publications/poster**

REQUIRED SIGN

Signage enhancing public awareness of SRF Assistance agreements should be included for the project consistent with guidance found at: https://www.epa.gov/cwsrf/enhancing-public-awareness-srf-assistance-agreements

SRF SPECIAL CONDITIONS

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION LOWER TIER COVERED TRANSACTIONS

Instructions for Certification

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

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or had become erroneous by reason of changed circumstances.

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

5. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

6. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not proposed for debarment under 48 CFR part 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from covered transactions, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

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

9. Except for transactions authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

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

_____

Organization Name

_____

Name and Title of Authorized Representative

_____

Signature

Date

DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION

1. General

This project includes federal financial assistance in the form of a State Revolving Fund (SRF) loan. Owner and Contractor/Bidder are required to make good faith efforts with adequate documentation to include disadvantaged business enterprises (DBEs) as subcontractors or suppliers on this project. More detailed regulations are published under 40 CFR Part 33.

2. DBE Certification

DBEs include minority business enterprises (MBEs) and women's business enterprises (WBEs). MBEs and WBEs must be independently certified as such in order to participate as a DBE. Certification can be through the Utah Department of Transportation (UDOT) or other valid government or private organizations. UDOT maintains their list of certified DBE firms on the internet at **https://www.udot.utah.gov/connect/business/civil-rights/,** You should review this internet page to get the most recent list of UDOT certified DBE firms. If a desired DBE is not certified through UDOT, the DBE should submit a copy of their independent certification to Skyler Davies, P.E. Division of Water Quality sdavies@utah.gov for review. If a desired DBE does not currently have an independent DBE certification, they can contact EPA Region 8's DBE Coordinator, Lindsay Seeger, phone 303-312-6564, e-mail **seeger.lindsay@epa.gov** to possibly obtain certification through EPA.

3. Good Faith Efforts

Owner and Contractor/Bidder must make the following good faith efforts when soliciting contractors, subcontractors, or suppliers to procure construction, equipment, services, and supplies on this project:

(a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

(b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

(c) Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible

into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

(d) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

(e) Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

(f) If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

(g) Failure to comply with the six DBE Good Faith Efforts can be considered grounds for determining a bid to be non-responsive.

4. Fair Share Objective

The Utah SRF Program has negotiated DBE fair share objective percentages with the United States Environmental Protection Agency. These are goals, not quotas. The requirement is that Owner and Contractor/Bidder must show and document good faith efforts to solicit DBE participation. The goals are:

	MBE	WBE
Construction	4.0%	2.0%
Equipment	0.25%	0.25%
Services	0.50%	0.50%
Supplies	0.25%	0.25%

5. Documentation for Bidder to Submit with Bid

(a) Contractor/Bidder shall submit documentation with its bid to demonstrate compliance with good faith effort requirements. Examples of documentation include copies of advertisements in journals and newspapers, telephone logs, and/or direct correspondence. The attached "Disadvantaged Business Enterprise Bidder Good Faith Effort Documentation" form may be used as part of the documentation.

(b) Contractor/Bidder shall submit with its bid a "bidders list" of all firms that provided Contractor/Bidder a bid or quote on this project. The bidders list shall include both DBE and non-DBE bidders. Required information for each bidder includes 1) entity's name and point of contact, 2) entity's mailing address, telephone number, and e-mail address, 3) procurement on which entity bid or quoted and when, and 4) entity's status as a MBE/WBE or non-DBE. Solicitations from non-DBEs can be included on the "Disadvantaged Business Enterprise Bidder Good Faith Effort Documentation" form or separately on a similar form.

6. Documentation for Bidder to Submit with Bid or Proposal Package

(a) Contractor/Bidder shall have its DBE subcontractors complete EPA Form 6100–3—DBE Program Subcontractor Performance Form and shall include all completed forms as part of the bid or proposal package.

(b) Contractor/Bidder shall complete and submit EPA Form 6100–4—DBE Program Subcontractor Utilization Form as part of the bid or proposal package.

7. Documentation for Owner to Submit to SRF Program

Before awarding the contract, Owner shall submit the following items to the SRF program for approval:

(a) The bid and all documentation of the apparent successful bidder.

(b) EPA Forms 6100-3 and 6100-4.

(c) A composite bidders list. This shall be created from the lists submitted by the various Bidders with their bids.

Submit this information to
Skyler Davies, P.E.
Utah Division of Water Quality
sdavies@utah.gov

8. Other Requirements and Information

(a) Contractor must pay its subcontractors for satisfactory performance no more than 30 days from Contractor's receipt of payment from Owner.

(b) Owner must be notified in writing by Contractor prior to any termination of a DBE subcontractor for Contractor's convenience. Owner must pass such notification along to the Utah SRF program.

(c) If a DBE subcontractor fails to complete work under the subcontract for any reason, Contractor must employ the six good faith efforts if soliciting a replacement subcontractor.

(d) Contractor must employ the six good faith efforts even if Contractor has achieved its fair share objectives.

(e) Contractor must provide EPA Form 6100– 2—DBE Program Subcontractor Participation Form to all of its DBE subcontractors. EPA Form 6100–2 gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have, for example reasons why

the DBE subcontractor believes it was terminated by the prime contractor. DBE subcontractors may send completed copies of EPA Form 6100–2 directly to the appropriate EPA DBE Coordinator. The EPA DBE Coordinator for this region is Lindsay Seeger, phone 303-312-6564, e-mail **seeger.lindsay@epa.gov**.

(f) Copies of EPA Form 6100–2—DBE Program Subcontractor Participation Form, EPA Form 6100–3—DBE Program Subcontractor Performance Form and EPA Form 6100–4—DBE Program Subcontractor Utilization Form may be obtained from EPA OSDBU's Home Page on the Internet or directly from EPA OSDBU. Copies of these forms are also attached to this contract.

If a list of solicitations from non-DBE subcontractors is not included with the bid, it will be required to be submitted prior to the Award of Contract. Additionally, if EPA Forms 6100-3 and 6100-4 are not completed at the time of bid for the DBE bids selected by the Contractor for the project, they will be required to be completed prior to the Award of Contract.

(1) EPA Form 6100-3 – DBE Program Subcontractor Performance Form. This form captures an intended subcontractor's description of work to be performed for the prime contractor and the price of the work submitted to the prime. This form is a documents of the Contractor's Good Faith Effort from the DBE's perspective.

(2) EPA Form 6100-4 – DBE Program Subcontractor Utilization Form. This form captures the prime's intended use of an identified DBE subcontractor, and the estimated dollar amount of the subcontract. This form is a documents of the Contractor's Good Faith Effort from the Contractor's perspective.

(g) Contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. Contractor shall carry out applicable requirements of 40 CFR part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by Contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

DISADVANTAGED BUSINESS ENTERPRISE BIDDER GOOD FAITH EFFORT DOCUMENTATION

SUBCONTRACTOR SOLICITATION INFORMATION							
Name, Address & Phone Number of Subcontractor Contacted	Date Request for Quote Sent	Description of Work Offered	Date of Phone Follow-up & Person Contacted	Amount of Quote or Reason for Not Quoting - a	Quote Accepted? If not, List Reason for Rejection	Indicate MBE/WBE or non-DBE	Source of MBE/WBE Independent Certification

a-Use additional sheets if necessary.

The undersigned hereby certifies that the above information is true and correct.

_____
Contractor

By: _____ _____
Signature Title

Date: _____

MBE/WBE PROCUREMENTS MADE DURING REPORTING PERIOD
EPA Financial Assistance Agreement Number: _____

1. Procurement Made By			2. Business Enterprise		3. $ Value of Procurement	4. Date of Award MM/DD/YY	5. Type of Product or Services (Enter Code)	6. Name/Address/Phone Number of MBE/WBE Contractor or Vendor
Recipient	Sub-Recipient and/or SRF Loan Recipient	Prime	Minority	Women				

Type of product or service codes:

1 = Construction 2 = Supplies 3 = Services 4 = Equipment

Note: Refer to Terms and conditions of your Assistance Agreement to determine the frequency of reporting. Recipients are required to submit MBE/WBE reports to EPA beginning with the Federal fiscal year quarter the recipients receive the award, continuing until the project is completed.

EPA FORM 5700-52A - (Approval Expires 01/31/11)

United States Environmental Protection Agency

OMB Control No.: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE[1] subcontractor[2] the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g. in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name	Project Name	
Bid/Proposal No.	Assistance Agreement ID No. (if known) **CS490001**	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity: **Utah Division of Water Quality**	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services, Equipment or Supplies	Amount Received by Prime Contractor

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entites that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

OMB Control No.: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-2 (DBE Subcontractor Participation Form)

United States Environmental Protection Agency

OMB Control No.: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

This form is intended to capture the DBE[1] subcontractor's[2] description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractors bid or proposal package.

Subcontractor Name	Project Name	
Bid/Proposal No.	Assistance Agreement ID No. (if known) **CS490001**	Point of Contact
Address		
Telephone No.	Email Address	
Prime Contractor Name	Issuing/Funding Entity: **Utah Division of Water Quality**	

Contract Item Number	**Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies**	**Price of Work Submitted to the Prime Contractor**
DBE Certified By:___ DOT ____ SBA ____ Other:_____	Meets / exceeds EPA certification standards? ____ YES ____ NO ____ Unknown	

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[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

OMB Control No.: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Performance Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-3 (DBE Subcontractor Performance Form)

United States Environmental Protection Agency

OMB Control No.: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE[1] subcontractors[2] and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name
Bid/Proposal No.	Assistance Agreement ID No. (if known) **CS490001**	Point of Contact
Address		
Telephone No.		Email Address
Issuing/Funding Entity: **Utah Division of Water Quality**		

I have identified potential DBE certified subcontractors	___ YES	___ NO

Subcontractor Name/ Company Name	**Company Address/ Phone/ Email**	**Est. Dollar Amt**	**Currently DBE Certified?**

Continue on back if needed

[1] A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entites that meet or exceed EPA certification standards as described in 40 CFR 33.202.

[2] Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

OMB Control No.: 2090-0030
Approved: 8/13/2013
Approval Expires: 8/31/2015

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Utilization Form

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

Prime Contractor Signature	Print Name
Title	**Date**

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

EQUAL EMPLOYMENT OPPORTUNITY and AFFIRMATIVE ACTION REQUIREMENTS on FEDERALLY ASSISTED CONSTRUCTION CONTRACTS

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

   Goal for female participation in each trade: 6.9%

   Minority participation goals in each trade:

County	Goal
Beaver, Garfield, Iron, Kane, Washington	12.6
Utah, Provo-Orem	2.4
Davis, Salt Lake, Tooele, Weber, Salt Lake City - Ogden	6.0
Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Juab, Millard, Morgan, Piute, Rich, Sanpete, Sevier, Summit, Uintah, Wasatch, Wayne	5.1

   These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

   The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number for the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed. An example notification letter is available on the next page.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is Morgan County, Utah.

This notice shall be included in, and shall be a part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6.

CONTRACTOR'S NAME, ADDRESS & TELEPHONE NUMBER

RETURN TO:
USDOL/OFCCP
Denver District Office
1244 Speer Blvd., Suite 520
Denver CO 80204

FAX: 720-264-3211
ATTN: Jerome Carter

EMPLOYER ID NUMBER OF CONTRACTOR:

Per our obligation under 41 CFR 60-4.2, we are submitting the following information regarding our subcontractor(s) whose contract is in excess of $10,000 on our Federal or federally assisted construction project:

CONTRACT INFORMATION

PROJECT AND LOCATION:				
Dollar Amount of Contract	Estimated Start Date	Estimated Completion Date	Contract No.	Geographical Area

NOTIFICATION OF SUBCONTRACTS AWARDED (>$10,000)

Subcontractor's Name, Address, & Phone Number	Employer ID Number of Subcontractor	Estimated $ Amount of Subcontract	Estimated Start Date	Estimated Completion Date

EQUAL OPPORTUNITY CLAUSES

A. The Equal Opportunity Clause published at 41 CFR 60-1.4(b) is required to be included in, and is part of, all nonexempt federally assisted construction contracts and subcontracts (including this Contract). The Equal Opportunity Clause shall be considered to be a part of every contract and subcontract required by the regulations to include such a clause, whether or not it is physically incorporated in such contracts. The notices required to be posted by paragraphs (1) and (3) of the Equal Opportunity Clause shall be the "Equal Employment Opportunity is the Law" poster approved by the Office of Federal Contract Compliance Programs and available on the internet at: **https://www.dol.gov/agencies/oasam/centers-offices/civil-rights-center/external/compliance-assistance.**

EQUAL OPPORTUNITY CLAUSE (41 CFR 60-1.4(b))

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their 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 contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor 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 advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor 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.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts

by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction 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.

(7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) 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 contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

B. The Standard Federal Equal Employment Opportunity Construction Contract Specifications published at 41 CFR 60-4.3(a) are required to be included in, and are part of, all federal and federally assisted construction contracts and subcontracts (including this Contract) in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6 and in construction subcontracts in excess of $10,000 necessary in whole or in part to the performance of non-construction Federal contracts and subcontracts covered under Executive Order 11246. These Specifications shall be considered to be a part of every contract and subcontract required by the regulations to include such a clause, whether or not it is physically incorporated in such contracts.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

1. As used in these specifications:

    a. "Covered Area" means the geographical area described in the solicitation from which this contract resulted;

    b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

    c. "Employer identification number" means the Federal Social Security number used on the employer's quarterly Federal Tax Return, U.S. Treasury Department Form 941.

    d. "Minority" includes:

        (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

        (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

        (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);

        (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area, (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith

effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs (7)(a) through (p) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably by able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the FEDERAL REGISTER in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

    a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with

specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the areas which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under (7)(b) above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time

and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7)(a) through (p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under (7)(a) through (p) of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally, the contractor may be in violation of the Executive order if a specific minority group of women is under-utilized).

10. The contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph (7) of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

Attachment 1
SRF Required Front-End Specifications
(This form must be completed and signed by Prime Contractor and Submitted with the bid.)

U.S. Environmental Protection Agency
Certification of Non-Segregated Facilities

(Applicable to contracts, subcontracts, and agreements with applicants who are themselves performing Federally assisted construction contracts, exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause.)

By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant, or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national original, because of habit, local custom, or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause; that we will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NON-SEGREGATED FACILITIES

A Certification of Non-segregated Facilities, as required by the May 9, 1967, order (33 F.R. 7808, May 28, 1968) on Elimination of Segregated Facilities, by the Secretary of Labor must be submitted prior to the award of the subcontract exceeding $10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

_____

Signature Date

_____

Name and Title of Signer (Please Type)

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

February 2009 EPA-7 5720-4.2

PROHIBITION AGAINST
LISTED VIOLATING FACILITIES

A. REQUIREMENTS

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by Pub. L. 92-604) and section 308 of the Clean Water Act (33 U.S.C. 1251, as amended), respectively, which relate to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this contract.

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency list of violating facilities on the date when this contract was awarded unless and until the EPA eliminates the name of such facility or facilities from the listing.

(3) To use his best efforts to comply with clean air and clean water standards at the facilities in which the contract is being performed.

(4) To insert the substance of the provisions of this clause, including this paragraph (4), in any nonexempt subcontract.

B. DEFINITIONS

(1) Air Act means the Clean Air Act, as amended (42 U.S.C. 1857 et seq.).

(2) Water Act means the Clean Water Act, as amended (33 U.S.C. 1251 et seq.).

(3) Clean Air Standards means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 (d) of the Air Act (42 U.S.C. 1857c-5(d)), an approved implementation procedure or plan under section 111 (c) or section 111(d), or an approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 1857c-7(d)).

(4) Clean Water Standards means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by a local government to ensure compliance with pretreatment regulations as required by section 307 of Water Act (33 U.S.C. 1317).

(5) Compliance means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent

jurisdiction, the Environmental Protection Agency in accordance with the requirements of the Air Act or Water Act and regulations.

(6) Facility means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be used in the performance of a contract or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are located in one geographical area.

WILLIAMS-STEIGER OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

A. AUTHORITY

(1) The contractor is subject to the provisions of the Williams-Steiger Occupational Safety and Health Act of 1970.

(2) These construction documents and the joint and several phases of construction hereby contemplated are to be governed, at all times, by applicable provisions of the Federal law(s), including but not limited to the latest amendment of the following:

a. Williams-Steiger Occupational Safety and Health Act of 1970, Public Law 94-596;

b. Part 1910 - Occupational Safety and Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;

c. Part 1926 - Safety and Health Regulations for Construction, Chapter XVII of Title 29, Code of Federal Regulations.

B. SAFETY AND HEALTH PROGRAM REQUIREMENTS

(1) This project, its prime contractor and its subcontractors, shall at all times be governed by Chapter XVII of Title 29, Code of Federal Regulations, Part 1926 - Safety and Health Regulations for Construction (29 CFR 22801), as amended to date.

(2) To implement the program and to provide safe and healthful working conditions for all persons, general project safety meetings will be conducted at the site at least once each month during the course of construction, by the construction superintendent or his/her designated safety officer. Notice of such meeting shall be issued not less than three (3) days prior, stating the exact time, location, and agenda to be included. Attendance by the owner, architect, general foreman, shop steward(s), and trades, or their designated representatives, witnessed in writing as such, shall be mandatory.

(3) To further implement the program, each trade shall conduct a short gang meeting, not less than once a week, to review project safety requirements mandatory for all persons during the coming week. The gang foreman shall report the agenda and specific items covered to the project superintendent, who shall incorporate these items in his/her daily log or report.

(4) The prime contractor and all subcontractors shall immediately report all accidents, injuries, or health hazards to the owner and architect, or their designated representatives, in writing. This shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Act of 1970.

(5) This program shall become a part of the contract documents and the contract between the owner and prime contractor, prime contractor and all subcontractors, as though fully written therein.

ANTI-KICKBACKS

Contractor shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) as supplemented in the Department of Labor Regulations (29 CFR, Part 3). This Act provides that Contractor is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he is otherwise entitled.

Contractor certifies and warrants that no gratuities, kickbacks and contingency fees were paid in connection with this contract, nor were any fees, commissions, gifts, or other considerations made contingent upon the award of this contract.

Contractor certifies that, to Contractor's knowledge, no state employee has any personal or beneficial interest whatsoever in the services described in this Contract.

No staff member of Contractor, compensated either partially or wholly with funds disbursed pursuant to the Contract, shall engage in any Contract or activity which would constitute a conflict of interest as related to this Contract.

DISCOVERY OF ARCHAEOLOGICAL AND OTHER HISTORICAL ITEMS

In the event of an archaeological find during any phase of construction, the following procedure will be followed:

1. Construction shall be halted, with as little disruption to the archaeological site as possible.
2. Contractor shall notify Owner who shall contact the State Historic Preservation Officer.
3. The State Historic Preservation Officer may decide to have an archaeologist inspect the site and make recommendations about the steps needed to protect the site, before construction is resumed.
4. The entire event should be handled as expediently as possible in order to hold the loss in construction time to a minimum while still protecting archaeological finds.

A similar procedure should be followed with regard to more recent historical resources. Should any artifacts, housing sites, etc., be uncovered, the same procedure should be followed as for an archaeological find.

In the event archaeological/historical data are evaluated to meet National Register criteria, the Advisory Council on Historic Preservation may be notified and asked to comment by the Utah State Revolving Fund Program.

ACCESS

Contractor and loan recipient shall insure that authorized representatives of the Utah DEQ, State Historic Preservation Office, US EPA, Comptroller General, Inspector General, and other applicable federal and state agencies and officials will have access to the project work whenever it is in preparation or progress and shall provide proper facilities for such access and inspection. Contractor shall allow these representatives to have access to any books, documents, plans, reports, papers, and other records of Contractor which are pertinent to the project for the purpose of making audit, examination, excerpts, copies and transcriptions thereof and to interview any officer or employee. Contractor shall insure that all subagreements will also afford access to such project work, sites, documents, records, and persons.

SITE EROSION AND SEDIMENT CONTROL MEASURES

Every effort shall be made by Contractor and subcontractors to prevent and correct problems associated with erosion and runoff processes which could occur during and after project construction. The efforts should be consistent with applicable local ordinances and the Nonpoint Source Pollution Control Guidance. Whenever appropriate, Contractor's efforts shall reflect the following engineering principles:

(a) When appropriate, land grading and excavating should be kept at a minimum to reduce the possibility of creating runoff and erosion problems which require extensive control measures.
(b) Whenever possible, topsoil should be removed and stockpiled before grading begins.
(c) Land exposure should be minimized in terms of area and time.
(d) Exposed areas subject to erosion should be covered as quickly as possible by means of mulching or vegetation.
(e) Natural vegetation should be retained whenever feasible.
(f) Early completion of stabilized drainage systems (temporary and permanent systems) will substantially reduce erosion potential.
(g) Roadways and parking lots should be paved or otherwise stabilized as soon as feasible.
(h) Clearing and grading should not be started until a firm construction schedule is known and can be effectively coordinated with grading and clearing activity.

UPDES CONSTRUCTION RELATED DISCHARGE PERMITS

Construction projects which will disturb one or more acres will require coverage under the State of Utah General Permit for Storm Water Discharges Associated with Large Construction Activities. Contractor is responsible for obtaining coverage under the appropriate permit and maintaining compliance until Owner accepts the Work as complete. For additional information see **https://deq.utah.gov/water-quality/general-construction-storm-water-updes-permits**.

Certain construction activities such as dewatering, flushing, testing, and disinfection require coverage under the State of Utah General Permit for Temporary Discharges or under a separate discharge permit. Contractor is responsible for obtaining any necessary coverage and maintaining compliance. For more information see **https://deq.utah.gov/water-quality/general-construction-storm-water-updes-permits**.

AIR QUALITY PROTECTION MEASURES

Contractor shall adhere to effective dust control procedures as required under the Utah Air Quality Standards and Regulations UAC R307. If asbestos is encountered during this project, Contractor shall follow standards for handling according to UAC R307-801. Contractor shall adhere to proper trade waste and materials disposal.

PRESERVATION OF OPEN COMPETITION AND GOVERNMENT NEUTRALITY TOWARDS GOVERNMENT CONTRACTORS' LABOR RELATIONS ON FEDERAL AND FEDERALLY FUNDED CONSTRUCTION PROJECTS

The assistance recipient agrees to comply with Executive Order 13202 (Feb. 22, 2001, 66 Federal Register 11225) of February 17, 2001, entitled "Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects," as amended by Executive Order 13208 (April 11, 2001, 66 Federal Register 18717) of April 6, 2001, entitled "Amendment to Executive Order 13202, Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects.

Amend 48 CFR Part 36.202 by adding paragraph (d) to read as follows:

(d) In accordance with Executive Order 13202, of February 17, 2001, Preservation of Open Competition and Government Neutrality Towards Government Contractors' Labor Relations on Federal and Federally Funded Construction Projects, as amended on April 6, 2001—

(1) The Government, or any construction manager acting on behalf of the Government, must not—

(i) Require or prohibit offerors, contractors, or subcontractors to enter into or adhere to agreements with one or more labor organizations (as defined in 42 U.S.C. 2000e(d)) on the same or other related construction projects; or

(ii) Otherwise discriminate against offerors, contractors, or subcontractors for becoming, refusing to become, or remaining signatories or otherwise adhering to agreements with one or more labor organizations, on the same or other related construction projects.

(2) Nothing in this paragraph prohibits offerors, contractors, or subcontractors from voluntarily entering into project labor agreements.

(3) The head of the agency may exempt a construction project from this policy if the agency head finds that, as of February 17, 2001—

(i) The agency or a construction manager acting on behalf of the Government had issued or was a party to bid specifications, project agreements, agreements with one or more labor organizations, or other controlling documents with respect to that particular project, which contained any of the requirements or prohibitions in paragraph (d)(1) of this section; and

(ii) One or more construction contracts subject to such requirements or prohibitions had been awarded.

(4) The head of the agency may exempt a particular project, contract, or subcontract from this policy upon a finding that special circumstances require an exemption in order to avert an imminent threat to public health or safety, or to serve the national security. A finding of "special circumstances" may not be based on the possibility or presence of a labor dispute concerning the use of contractors or subcontractors who are nonsignatories to, or otherwise do not adhere to, agreements with one or more labor organizations, or concerning employees on the project who are not members of or affiliated with a labor organization.

AMERICAN IRON AND STEEL REQUIREMENT

None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) shall be used for a project for the construction, alteration, maintenance, or repair of a public treatment works unless all of the iron and steel products used in the project are produced in the United States.

The Contractor acknowledges to and for the benefit of Mountain Green Sewer Improvement District ("Purchaser") and the Utah Division of Water Quality (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund (CWSRF) and/or Drinking Water State Revolving Fund (DWSRF) that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that:

(a) the Contractor has reviewed and understands the American Iron and Steel Requirement,
(b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and
(c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State.

Notwithstanding any other provision of this Agreement, any failure to comply with this requirement by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

The full American Iron and Steel Guidance can be found at: **http://water.epa.gov/grants_funding/aisrequirement.cfm**

AMERICAN IRON AND STEEL REQUIREMENT GUIDANCE

Covered American Iron and Steel (AIS) Products

1. **What is an iron or steel product?**
   For purposes of the CWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the project:
   - Lined or unlined pipes or fittings;
   - Manhole Covers;
   - Municipal Castings (defined in more detail later in this guidance);
   - Hydrants;
   - Tanks;
   - Flanges;
   - Pipe clamps and restraints;
   - Valves;
   - Structural steel (defined in more detail later in this guidance);
   - Reinforced precast concrete; and
   - Construction materials (defined in more detail later in this guidance).

2. **What does the term 'primarily iron or steel' mean?**
   'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

   For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and then the cost would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e. stem, coupling, valve, seals, etc.). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed later in this guidance.

3. **If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?**
   The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

4. **What is the definition of steel?**
   Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, ally steel, stainless steel, tool steel and other

specialty steels.

5. **What does 'produced in the United States' mean?**
   Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

6. **Are the raw materials used in the production of iron or steel required to come from US sources?**
   No, raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

7. **If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?**
   No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes or scaffolding, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

8. **What is the definition of 'municipal castings'?**
   Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:
   - Access Hatches;
   - Ballast Screen;
   - Benches (Iron or Steel);
   - Bollards;
   - Cast Bases;
   - Cast Iron Hinged Hatches, Square and Rectangular;
   - Cast Iron Riser Rings;
   - Catch Basin Inlet;
   - Cleanout/Monument Boxes;
   - Construction Covers and Frames;
   - Curb and Corner Guards;
   - Curb Openings;

- Detectable Warning Plates;
- Downspout Shoes (Boot, Inlet);
- Drainage Grates, Frames and Curb Inlets;
- Inlets;
- Junction Boxes;
- Lampposts;
- Manhole Covers, Rings and Frames, Risers;
- Meter Boxes;
- Steel Hinged Hatches, Square and Rectangular;
- Steel Riser Rings;
- Trash receptacles;
- Tree Grates;
- Tree Guards;
- Trench Grates; and
- Valve Boxes, Covers and Risers.

9. What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

10. What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products:

- wire rod,
- bar,
- angles,
- concrete reinforcing bar,
- wire,
- wire cloth,
- wire rope and cables,
- tubing,
- framing,
- joists,
- trusses,
- fasteners (i.e. nuts and bolts),
- welding rods,
- decking,

- grating,
- railings,
- stairs,
- access ramps,
- fire escapes,
- ladders,
- wall panels,
- dome structures,
- roofing,
- ductwork,
- surface drains,
- cable hanging systems,
- manhole steps,
- fencing and fence tubing,
- guardrails,
- doors,
- stationary screens

11. What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials:

- pumps,
- motors,
- gear reducers,
- drives (including variable frequency drives (VFDs))
- electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators)
- mixers,
- gates,
- motorized screens (such as traveling screens),
- blowers/aeration equipment,
- compressors,
- meters,
- sensors,
- controls and switches,
- supervisory control and data acquisition (SCADA)
- membrane bioreactor systems,
- membrane filtrations systems,

- filters,
- clarifiers and clarifier mechanisms,
- rakes,
- grinders,
- disinfection systems,
- presses (including belt presses),
- conveyors,
- cranes,
- HVAC (excluding ductwork),
- water heaters,
- heat exchangers,
- generators,
- cabinetry and housings (such as electrical boxes/enclosures),
- lighting fixtures,
- electrical conduit,
- emergency life systems,
- metal office furniture,
- shelving,
- laboratory equipment,
- analytical instrumentation,
- dewatering equipment

12. **If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?**
    No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

13. **What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?**
    While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing rebar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

    If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and mush be produced in the US.

<u>Compliance with AIS Requirements</u>

1. **How should an assistance recipient document compliance with the AIS requirement?**
   In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement (bond, grant agreement), all the way down to the subcontractor and purchase agreements. Language for

contracts should be similar to the American Iron and Steel Requirement provision in this contract.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure adherence to AIS requirements and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer, processor, etc.) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. A sample certification is located in this section. These certifications should be collected and maintained by the assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it does not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

2. **How will the State will ensure assistance recipients are complying with the AIS requirement?**
   In order to ensure compliance with the AIS requirement, the State must include specific AIS contract language in the assistance agreement (i.e. bond, grant agreement, etc.). The assistance recipient must include specific AIS contract language in the project's contract documents.

   The State will also conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

3. **What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?**
   If a potentially noncompliant product is identified, the State will notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions:
   - request a waiver where appropriate;
   - require the removal of the non-domestic item; or

- withhold payment for all or part of the project.

Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act and 40 CRF part 31 grant regulations in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraudulent activities are suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

4. **How do international trade agreements affect the implementation of the AIS requirements?**
   The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

AIS Requirement Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described later in this guidance will allow States to apply for waiver, on the behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

- Reasonably Available Quantity means the quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.
- Satisfactory Quality means the quality of iron or steel products, as specified in the project plans and designs.
- Assistance Recipient means a borrower or grantee that receives funding from a State CWSRF program.

Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that waiver applicants review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products				
— Relevant excerpts from the bid documents used by the contractors to complete the comparison				
— A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market				
• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials • Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Sample Step Certification Letter

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date
Company Name
Company Address
City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

Sample Certification Letter

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date
Company Name
Company Address
City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

DAVIS BACON PREVAILING WAGE REQUIREMENTS

"Notwithstanding any other provision of law and in a manner consistent with other provisions in this Act, all laborers and mechanics employed by contractors and sub-contractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to this Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code. With respect to the labor standards specified in this section, the Secretary of Labor shall have the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (64 Stat. 1267; 5 U.S.C. App.) and section 3145 of title 40, United States Code."

Federal Labor Standards Provisions (from 29 CFR 5.5)

(a) (1) *Minimum wages.*

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

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH–1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii) (A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be

employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

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

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

(3) *Payrolls and basic records.*

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

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the project owner. Project owner will provide copies to the Utah SRF Program upon request. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (*e.g.* , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the US Department of Labor/Wage and Hour Division Web site at: ***https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347.pdf***. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the project owner. Project owner shall provide such information, upon request, to the Utah SRF Program or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the project owner or other government agencies.

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

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

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

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

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

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

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

(4) *Apprentices and trainees*

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

with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

(6) *Subcontracts.* The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the project owner

and/or the Utah SRF Program may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

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

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

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

(10) *Certification of eligibility.*

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

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

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

(b) *Contract Work Hours and Safety Standards Act.* As used in this paragraph, the terms *laborers* and *mechanics* include watchmen and guards.

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

(2) *Violation; liability for unpaid wages; liquidated damages.* In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor

responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

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

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

Other related requirements and information

1. Based on 29 CFR 5.6(a)(3): Owner shall make such investigations as may be necessary to assure compliance with the labor standards provisions and related statutes and regulations. Investigations shall be made with such frequency as may be necessary to assure compliance. Such investigations shall include interviews with employees, which shall be taken in confidence, and examinations of payroll data and evidence of registration and certification with respect to apprenticeship and training plans. In making such examinations, particular care shall be taken to determine the correctness of classifications and to determine whether there is a disproportionate employment of laborers and of apprentices or trainees registered in approved programs. Such investigations shall also include evidence of fringe benefit plans and payments thereunder. Complaints of alleged violations shall be given priority.

2. A brief summary of required Davis Bacon compliance checking activities by Owner:

   - Make sure the Davis-Bacon poster and the wage determination are posted at the job site in a prominent and accessible place where both can be easily seen by the workers.
   - Review the weekly payrolls for compliance with the requirements.
   - Interview employees to cross check the payrolls and to help ensure compliance with the requirements.

3. The regulations do not require a specific interval and number of employee interviews; however, Owner shall make the interval and number of interviews commensurate with the size and complexity of the project so as to provide a reasonable check on Contractor's compliance.

4. The regulations do not require a specific interview format. Owner can use or adapt other agencies' Davis-Bacon interview forms, such as the one provided by the US Department of Housing and Urban Development, form HUD-11, which can be found at **https://www.hud.gov/sites/dfiles/OCHCO/documents/11.pdf** or Standard Form -1445 which can be found **at https://www.gsa.gov/cdnstatic/SF%201445.pdf?forceDownload=1**.

5. Owner shall maintain the payrolls, interview records, and other compliance related records for a minimum of three years after completion of the contract and shall provide them upon request to the Utah SRF Program or to applicable federal agencies.

6. Additional compliance information and assistance is available at **https://www.dol.gov/agencies/whd/government-contracts/construction** and other related websites.

7. Following are the **identifier codes** used to reference the various craft unions. Examples of classifications for which their local unions commonly negotiate wage and fringe benefit rates are shown in parentheses.

   ASBE = International Association of Heat and Frost Insulators and Asbestos Workers

   BOIL = International Brotherhood of Boiler Makers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers

   BRXX = International Union of Bricklayers, and Allied Craftsmen (bricklayers, cement masons, stone masons, tile, marble and terrazzo workers)

   CARP = United Brotherhood of Carpenters and Joiners of America (carpenter, millwright, piledrivermen, soft floor layers, divers)

   ELEC = International Brotherhood of Electrical Workers (electricians, communication systems installers, and other low voltage specialty workers)

   ELEV = International Union of Elevator Constructors

   ENGI = International Union of Operating Engineers (operators of various types of power equipment)

   IRON = International Association of Bridge, Structural and Ornamental Iron Workers

   LABO = Laborers' International Union of North America

PAIN = International Brotherhood of Painters and Allied Trades (painters, drywall finishers, glaziers, soft floor layers)

PLAS = Operative Plasterers' and Cement Masons' International Association of the United States and Canada (cement masons, plasterers)

PLUM = United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada (plumbers, pipefitters, steamfitters, sprinkler fitters)

ROOF = United Union of Roofers, Waterproofers and Allied Workers

SHEE = Sheet Metal Workers International Association

SU.... = The "SU..." identifier is for rates derived from **su**rvey data where the union rate(s) were not determined to be prevailing for the classification(s) listed. (The data reported for such a classification and used in computing the prevailing rate may have included both union and non-union wage data.) Note that **various classifications,** for which non-union rates have been determined to be prevailing, may be listed in alphabetical order under this identifier, which the computer places into the wage determination in alphabetical order, as listed here.

TEAM = International Brotherhood of Teamsters

U.S. Department of Labor
Employment Standards Administration
Wage and Hour Division

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/esa/whd/forms/wh347instr.htm)

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

U.S. Wage and Hour Division

Rev. Dec. 2008

OMB No.: 1215-0149
Expires: 12/31/2011

NAME OF CONTRACTOR ☐ OR SUBCONTRACTOR ☐	ADDRESS	
PAYROLL NO.	FOR WEEK ENDING	PROJECT AND LOCATION / PROJECT OR CONTRACT NO.

(1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER	(2) NO. OF WITHHOLDING EXEMPTIONS	(3) WORK CLASSIFICATION	OT. OR ST.	(4) DAY AND DATE / HOURS WORKED EACH DAY	(5) TOTAL HOURS	(6) RATE OF PAY	(7) GROSS AMOUNT EARNED	(8) DEDUCTIONS: FICA	WITH-HOLDING TAX			OTHER	TOTAL DEDUCTIONS	(9) NET WAGES PAID FOR WEEK
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While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that is will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, ESA, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

(over)

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,
all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Start. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION

REMARKS:

Exception 8

NAME AND TITLE	SIGNATURE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.

"General Decision Number: UT20220096 09/09/2022

Superseded General Decision Number: UT20210096

State: Utah

Construction Type: Heavy
HEAVY CONSTRUCTION PROJECTS

Counties: Box Elder and Morgan Counties in Utah.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2022.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	02/25/2022
2	07/01/2022
3	09/09/2022

ELEC0354-005 06/01/2022

	Rates	Fringes
ELECTRICIAN	$ 36.09	1.3%+16.26

ENGI0003-034 07/01/2020

	Rates	Fringes
POWER EQUIPMENT OPERATOR (Mechanic)	$ 33.04	16.09

LABO0295-002 07/01/2019

	Rates	Fringes
TRAFFIC CONTROL (Flagger)	$ 23.71	9.78

* TEAM0222-004 07/01/2021

	Rates	Fringes
TRUCK DRIVER (Dump Truck)	$ 25.09	13.05

* SUUT2018-007 05/07/2020

	Rates	Fringes

CEMENT MASON/CONCRETE FINISHER...$ 19.69 1.17

LABORER: Common or General.....$ 20.39 3.29

LABORER: Pipelayer.....$ 14.68 ** 1.96

OPERATOR:
Backhoe/Excavator/Trackhoe.....$ 24.61 5.17

OPERATOR: Bobcat/Skid
Steer/Skid Loader.....$ 25.29 0.00

OPERATOR: Loader.....$ 24.02 5.67

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses

(29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which

these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

MEMORANDUM

SUBJECT: Prohibition on Certain Telecommunication and Video Surveillance Services or Equipment in the SRF Programs

FROM: Kiri Anderer, P.E., Acting Associate Branch Chief
Infrastructure Branch, OGWDW

Michael Deane, Branch Chief
State Revolving Fund Branch, OWM

TO: SRF Branch Chiefs
Regions 1-10

Effective August 13, 2020, recipients and subrecipients of EPA funded assistance agreements, including borrowers under EPA funded revolving loan funds, must comply with regulations at 2 CFR 200.216, *Prohibition on certain telecommunication and video surveillance services or equipment*, implementing section 889 of Public Law 115-232. The regulation prohibits the use of Federal funds to procure (enter into, extend, or renew contracts) or obtain equipment, systems, or services that use "covered telecommunications equipment or services" identified in the regulation as a substantial or essential component of any system, or as critical technology as part of any system. Prohibitions extend to the use of Federal funds by recipients and subrecipients to enter into a contract with an entity that "uses any equipment, system, or service that uses covered telecommunications equipment or services" as a substantial or essential component of any system, or as critical technology as part of any system. Certain equipment, systems, or services, including equipment, systems, or services produced or provided by entities subject to the prohibition are recorded in the System for Award Management exclusion list.

As described in section 889 of Public Law 115-232, covered telecommunications equipment or services includes:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.

- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Applicability in the State Revolving Fund (SRF) Programs

Clean Water and Drinking Water SRF (CWSRF and DWSRF) programs may not expend equivalency funds for these products on or after August 13, 2020. States must ensure that equivalency assistance agreements include the telecommunications prohibition condition provided by EPA's Office of Grants and Debarment (OGD) in OGD's most recent EPA General Terms and Conditions. The condition must also be in construction contracts associated with equivalency assistance agreements.

There is no exhaustive list of components and services that fall under the prohibition. State SRF managers and local assistance recipients should exercise due diligence and be particularly mindful of project components with internet or cellular connections. For example, recipients should be mindful of automatic meter reading (AMR) technology and advanced metering infrastructure (AMI), instrumentation control systems (e.g. process control systems, distributed control systems and programmable logic controls), and security cameras and other electronic security measures to ensure that those items are procured from a non-excluded entity. Items included in the prohibition are not eligible SRF costs, and the SRF programs cannot reimburse borrowers for these costs.

The prohibition also applies to the CWSRF administrative funds (if states are billing those costs to the federal CWSRF capitalization grant) and the four DWSRF set-asides. States should be mindful of items such as cell phones, computers, and mobile WiFi routers or hotspots funded by those accounts.

If you have questions on the implementation of this grant condition, please contact Michael Deane at Deane.Michael@epa.gov or Kiri Anderer at Anderer.Kirsten@epa.gov.

CONSTRUCTION SUBCONTRACT

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CONSTRUCTION SUBCONTRACT

This is a Construction Subcontract (Subcontract) between [Name of Contractor] (Contractor) and [Name of Subcontractor] (Subcontractor). This Subcontract is effective as of [Effective Date of Subcontract].

Prime Contract: Contractor has entered into a contract (Prime Contract) dated [Date of Prime Contract] with Mountain Green Sewer Improvement District (Owner).

Contractor and Subcontractor further agree as follows:

ARTICLE 1—PRELIMINARY MATTERS

1.01 *Prime Contract*

A. The Prime Contract requires Contractor to perform and furnish construction labor, materials, equipment, and services ("Prime Contract Work") in connection with the Project described therein. The Prime Contract (excluding compensation and other confidential information) is incorporated in this Subcontract by reference. Portions of the Prime Contract are attached as Exhibit 1 to this Subcontract; Subcontractor may review other non-confidential portions upon request. The Project described in the Prime Contract is summarized as follows:

[Describe project]

1.02 *Scope of Subcontract Work*

A. Contractor hereby retains Subcontractor to provide construction labor, materials, equipment, and services under this Subcontract described as follows:

[Here describe with specificity the scope of the Subcontract Work, or incorporate a scope of work exhibit. The subcontract scope of work will typically include specific reference to the portions of the Prime Contract—the Specification sections, Drawing numbers, etc.—that Subcontractor is responsible for performing.] ("Subcontract Work").

B. The Subcontract Work is a part of the Prime Contract Work. Except as otherwise stated in this Subcontract, the provisions of the Prime Contract that apply to the performance and quality of the Prime Contract Work apply to the Subcontract Work.

C. The express terms of this Paragraph 1.02 govern in establishing the Subcontract scope of work. The divisions and sections of the Prime Contract's Specifications and the identifications and organization of the Prime Contract's drawings do not control or limit Contractor in dividing the Work among subcontractors or suppliers, or delineating the work to be performed by, or obligations of any specific trade, including Subcontractor.

1.03 *Subcontract Documents*

A. The Subcontract Documents are identified in Article 14 of this Subcontract.

1.04 *Independent Contractor*

A. Subcontractor is an independent contractor, and is not an employee or partner of, or a joint-venturer with Contractor, and has no contractual relationship or privity with Owner or Owner's engineers or consultants.

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ARTICLE 2—OBLIGATIONS OF THE PRIME CONTRACT

2.01 *Incorporation of Prime Contract Obligations*

A. The Subcontractor is bound to the Contractor under the Subcontract to the same extent that the Contractor is bound to the Owner under the Prime Contract, and Subcontractor shall comply with all requirements, terms, and conditions of the Prime Contract that relate in any way to the performance and completion of the Subcontract Work.

B. The obligation of the Subcontractor to comply with the requirements, terms, and conditions of the Prime Contract does not provide any rights, benefits, or third-party beneficiary standing to the Subcontractor with respect to the Prime Contract.

2.02 *Precedence of Subcontract*

A. If a provision of this Subcontract conflicts with a provision of the Prime Contract, the terms of this Subcontract govern, unless under controlling laws the conflicted provision of the Prime Contract cannot be waived.

ARTICLE 3—SUBCONTRACT TIMES

3.01 *Subcontract Times*

A. The Subcontract Work will be completed in full:

1. on or before [insert Subcontract completion date].

2. within [insert number of days] days after notice to commence work at the site.

3. pursuant to the attached preliminary progress schedule.

B. Subcontractor shall provide all required submittals on a timely basis, and shall provide sufficient labor and materials to comply with the Contractor's progress schedule and avoid delaying the progress of Contractor's work under the Prime Contract. Subcontractor shall make modifications in the performance and completion of the Subcontract Work as necessary to comply with modifications, if any, in the Contractor's progress schedule.

C. The time for completion of the Subcontract Work, as set forth in Paragraph 3.01.A, and compliance with the Contractor's progress schedule, as set forth in Paragraph 3.01.B, all as duly modified under this Subcontract, together will be referred to as "Subcontract Times."

3.02 *Time of the Essence*

A. Subcontractor's obligation to comply with the Subcontract Times is of the essence of the Subcontract.

3.03 *Damages for Late Completion*

A. Subcontractor and Contractor recognize that Contractor will suffer financial loss if the Subcontract Work is not completed within the Subcontract Times.

B. The damages resulting to the Contractor may include liquidated damages, special damages, and other damages (if any) assessed by the Owner, actual damages claimed by the Owner as a result of the delay, and the Contractor's costs for extended general conditions, field overhead, and home office overhead.

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C. As a result of the losses, costs, and damages recognized in Paragraphs 3.03.A. and B., if Subcontractor fails to complete the Subcontract Work within the Subcontract Times, and without limiting any additional remedies available to Contractor, Subcontractor shall pay Contractor for losses, costs, and damages incurred by Contractor for Subcontractor's failure to comply with the Subcontract Times, including the share attributable to Subcontractor of delay damages and costs imposed on or levied against Contractor. Contractor has the right to set off any such amounts against payments due Subcontractor under this Subcontract.

ARTICLE 4—SUBCONTRACT PRICE

4.01 *Payment Obligation*

A. Contractor shall pay Subcontractor for completion of the Subcontract Work in accordance with the Subcontract Documents an amount equal to the sum of the amounts determined pursuant to the following paragraphs (Subcontract Price).

B. For all Subcontract Work other than Unit Price Work, a lump sum of: $[Lump sum amount].

1. Cash Allowances: All specific cash allowances are included in the above price and include the cost to Subcontractor (less any applicable trade discounts) of materials and equipment required by the cash allowances to be delivered at the site, and all applicable taxes. Subcontractor'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 Subcontract Price, and no demand for additional payment on account of any of the foregoing will be valid.

C. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work multiplied by the actual quantity of that item:

Unit Price Subcontract Work					
Item No.	Description	Unit	Estimated Quantity	Unit Price	Extended Price
Total of all Extended Prices (Unit Price Subcontract Work)					$

The extended prices for Unit Price Work set forth as of the Subcontract Date are based on estimated quantities. Estimated quantities are not guaranteed, and determinations of actual quantities will be verified by the Contractor and will be subject to any applicable procedures for measurement and verification under the Prime Contract.

ARTICLE 5—PAYMENT PROCEDURES

5.01 *Progress Payments*

A. *Applications for Payments*

1. Ten days prior to the date established in the Prime Contract for submission by the Contractor of the Contractor's application for each progress payment (but not more often than once a month), Subcontractor shall submit to Contractor for review a draft progress payment application covering the Subcontract Work completed as of the date of the

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progress payment application. The amount requested under each progress payment application will be calculated in accordance with Article 4, and: (a) for lump sum work by determining the percentage of the Subcontract Work completed as of the date of the progress payment application; (b) for unit price work by applying unit prices to units provided; (c) subject to subtraction to account for amounts previously paid. Subcontractor's progress payments will be subject to the retainage provisions of the Prime Contract, or to retainage of [number] percent, whichever is greater.

2. Each Subcontractor progress payment application must be accompanied by supporting documentation required by the Prime Contract to be attached to the Contractor's progress payment submission. The Subcontract progress payment application must also be accompanied by required lien waivers; a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all liens; and for stored material and equipment, evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein. All such supporting documentation must be satisfactory to Contractor and Owner.

3. Beginning with Subcontractor's second progress payment application, each Subcontractor progress payment application must include a Subcontractor's affidavit stating that all previous progress payments received on account of the Subcontract Work have been paid to persons and entities providing labor, equipment, materials and services on account of amounts received on behalf of said sub-subcontractors, suppliers, and vendors from prior progress payment applications. Each Subcontractor's affidavit must list all sub-subcontractors, suppliers, and vendors having contracts with Subcontractor to provide said labor, equipment, material, and services on the Project including the amount of each contract, the amount paid to date and the amount due or to become due to each sub-subcontractor, supplier, and vendor. Each progress payment application must also include lien waivers executed by each sub-subcontractor, supplier, and vendor listed on the Subcontractor's affidavit.

B. *Review of Applications*

1. Within five days after receipt of each draft progress payment application submitted by Subcontractor, Contractor will return the draft progress payment application with corrections (if any). Subcontractor will submit a final progress payment application, incorporating all resolved corrections, together with all supporting documentation, within three days thereafter.

2. Contractor may withhold amounts requested in one or more payment applications from the Subcontractor in whole or part if one or more of the following occurs:

   a. The Subcontract Work is defective, or completed Subcontract Work has been damaged, requiring correction or replacement;

   b. The Subcontract Price has been reduced by change orders;

   c. The Contractor has been required to correct defective Subcontract Work or complete Subcontract Work;

   d. Claims have been made against Contractor on account of Subcontractor's performance or furnishing of the Subcontract Work;

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e. Liens have been filed in connection with the Subcontract Work, except where Subcontractor has delivered a specific bond satisfactory to Contractor and Owner to secure the satisfaction and discharge of such liens;

f. The Owner has exercised a set-off against payments to Contractor attributable to Subcontractor's activities or performance of the Subcontract Work; or

g. The Subcontractor has defaulted under the terms of the Subcontract.

C. *Payment:* Contractor shall pay Subcontractor any amounts due to Subcontractor under a payment application for Subcontract Work within ten days after Contractor's receipt from the Owner of payment for such Subcontract Work.

ARTICLE 6—FINAL PAYMENT AND COMPLETION

6.01 *Final Payment*

A. Upon final completion of obligations under the Subcontract, including acceptance by Owner (or its representative) of the Subcontract Work as part of the Work under the Prime Contract, and submission and acceptance of all close-out documents required under the Subcontract, Subcontractor shall submit to Contractor an application for final payment and release of retainage, if any.

B. Final payment becomes due 10 days after Contractor's receipt of payment from the Owner of amounts requested on behalf of Subcontractor. Contractor's receipt of payment of retainage withheld by Owner from amounts due to Contractor for the Subcontract Work is an express condition precedent to Contractor's obligation to pay such retainage to Subcontractor.

6.02 *Final Lien Waivers*

A. Upon the request of Contractor, Subcontractor shall submit, as part of the application for final payment, a final waiver of lien and sworn statement indicating all sub-subcontractors, suppliers, and vendors, their contract amounts, and the final amounts paid to each sub-subcontractor, supplier, and vendor.

6.03 *Warranty of Title*

A. Subcontractor warrants and guarantees that title to all Subcontract Work, materials, and equipment furnished under the Subcontract will pass to Owner free and clear of all liens and other title defects, and all patent, licensing, copyright, or royalty obligations.

6.04 *Waiver of Claims*

A. Final payment by Contractor to Subcontractor constitutes:

1. A waiver of all claims by Contractor against Subcontractor, except claims arising from unsettled liens, from defective Subcontract Work appearing after final inspection, from failure to comply with the Subcontract Documents or the terms of any special guarantees specified therein, or from Subcontractor's continuing obligations under the Prime Contract; and

2. A waiver of all claims by Subcontractor against Contractor other than those previously made in accordance with the requirements herein that remain unsettled.

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ARTICLE 7—SUB-SUBCONTRACTORS

7.01 *Subcontractor's Responsibility*

A. Subcontractor shall be fully responsible to Contractor for all acts and omissions of the sub-subcontractors, suppliers, and other individuals or entities performing or furnishing any of the Subcontract Work, just as Subcontractor is responsible for Subcontractor's own acts and omissions.

7.02 *No Third-Party Relationships*

A. Nothing in the Subcontract Documents creates for the benefit of any such sub-subcontractor, supplier, or other individual or entity any contractual relationship between Contractor, Owner, or Owner's engineers or consultants and any such sub-subcontractor, supplier, or other individual or entity.

B. Nothing in the Subcontract Documents creates any obligation on the part of Contractor, Owner, or Engineer to pay or to see to the payment of any money due any such sub-subcontractor, supplier, or other individual or entity, except as may otherwise be required by laws and regulations.

ARTICLE 8—PERFORMANCE OF THE SUBCONTRACT WORK

8.01 *Subcontractor's Obligations*

A. Subcontractor shall provide all material, equipment, services, and labor necessary for the completion of the Subcontract Work.

B. All materials and equipment must be as specified in the Subcontract Documents and be of good quality and new, except as otherwise provided in the Subcontract Documents. Subcontractor shall provide Contractor with such information and test results required under the Prime Contract to verify the quality of the materials and equipment furnished under the Subcontract Documents.

8.02 *Verification of Existing Conditions*

A. The dimensions, locations, and limits of the Subcontract Work are shown or indicated in the Subcontract Documents.

B. The Contractor has used reasonable efforts to verify the accuracy of dimensions, locations, and limits in the Subcontract Documents, but takes no responsibility for the verification of information concerning actual conditions affecting the Subcontract Work. Subcontractor has an independent obligation to verify actual conditions, including but not limited to dimensions, locations, and limits, prior to ordering equipment and materials and performing the Subcontract Work, and shall be responsible for all costs and expenses resulting from the failure to verify such information.

8.03 *Supervision*

A. At all times during the progress of the Subcontract Work, Subcontractor shall assign an authorized representative to provide competent, on-site supervision. Such representative must not be replaced without written notice to Contractor except under extraordinary circumstances.

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B. Subcontractor shall be solely responsible for scheduling and coordinating the work of sub-subcontractors, suppliers, and other individuals or entities performing or furnishing any of the Subcontract Work under a direct or indirect contract with Subcontractor.

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

8.04 *Coordination with Other Subcontractors; Other Work at the Site*

A. Subcontractor shall cooperate with other subcontractors and coordinate its Subcontract Work and schedule with other subcontractors on the Project. Subcontractor shall attend coordination meetings and endeavor to resolve all conflicts with other subcontractors without the intervention of Contractor. If a conflict cannot be resolved without the intervention of Contractor, the decision of Contractor regarding resolution of the conflict will be final.

B. Subcontractor shall not damage, delay, or interfere with the work of other subcontractors or of Contractor, Owner, or others working at the site, shall be responsible for the cost of damage, delay, or interference caused by the operations of Subcontractor to the work of others.

8.05 *Prosecution of the Subcontract Work*

A. *Clean-up:* On not less than a daily basis, Subcontractor shall be responsible for cleaning up and removing all debris and waste resulting from the Subcontract Work, to avoid interference with the work and progress of others at the site. If Subcontractor fails to clean up and remove waste and debris in accordance with this provision, Contractor may provide for clean-up and removal of waste and debris at Subcontractor's expense.

B. *Hoisting and Lifting:* Subcontractor shall provide all hoisting and lifting required for the Subcontract Work, unless Contractor has otherwise expressly agreed to provide hoisting, lifting, or both.

C. *Temporary Utility Services and Temporary Facilities:* Subcontractor shall at its expense provide temporary utility services and temporary facilities needed for the performance of the Subcontract Work, except those temporary utility services and temporary facilities that Contractor has expressly agreed to provide at its expense.

D. *Safety and Protection*

1. Subcontractor shall perform the Subcontract Work in a safe manner, taking full responsibility for the prevention of harm or injury to its workforce, and taking all reasonable steps necessary to protect from harm, injury, or damage all persons, property, structures, materials, and equipment at or adjacent to the Subcontractor's work areas.

2. Subcontractor shall comply with the safety programs of the Owner and Contractor, when Subcontractor has been made aware of such requirements in writing.

3. Subcontractor shall coordinate the safety of its employees, Subcontractor's lower-tier subcontractors, and Subcontractor's suppliers with Contractor's safety representative, and shall comply with all applicable OSHA and other laws and regulations related to safety and protection. Subcontractor shall ensure that its employees and the on-site employees of Subcontractor's lower-tier subcontractors and suppliers are properly trained and

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understand (a) Owner's, Contractor's, and Subcontractor's safety requirements, and (b) applicable safety laws and regulations. Subcontractor is responsible for furnishing to Contractor and others as applicable all required material safety data sheets.

4. Subcontractor shall report promptly to Contractor all injuries, accidents, and damage that occurs during the performance of the Subcontract Work, and all failures or near-miss events that could have resulted in serious injury, even if no serious injury actually occurred.

E. *Labor:* Subcontractor shall comply with applicable labor and jurisdictional requirements to prevent strikes and other work stoppages and slowdowns that would interfere with the Subcontract Work and the work of others. Subcontractor shall be responsible for delays resulting from Subcontractor's violation of this provision.

F. *Communications with Owner and Engineer:* Subcontractor shall communicate with Owner, Owner's engineers, and Owner's other representatives solely through Contractor, with the following limited exceptions: (1) in the case of an emergency, Subcontractor may communicate directly with any entity or individual in the interests of safety and protection of property, (2) Subcontractor may directly request Owner to provide information about amounts paid to Contractor on account of Subcontract Work performed, and (3) Subcontractor may directly request Owner to provide Subcontractor with a copy of any payment bond furnished by Contractor.

8.06 *Correction and Warranties*

A. Subcontractor warrants and guarantees to Contractor that all Subcontract Work will be in accordance with the Subcontract Documents and will not be defective. Subcontractor's warranty and guarantee hereunder excludes defects or damage caused by abuse, modification, or improper maintenance or operation by persons other than Subcontractor and its sub-subcontractors, suppliers, or any other individual or entity for whom Subcontractor is responsible; or normal wear and tear under normal usage.

B. Subcontractor's obligation to perform and complete the Subcontract Work in accordance with the Subcontract Documents will be absolute and Subcontractor shall be fully responsible for the Subcontract Work under the Subcontract to the same extent that Contractor is responsible for the Subcontract Work to the Owner under the Prime Contract.

C. Subcontractor shall correct the Subcontract Work to the same extent that Contractor is required to correct the Prime Contract Work (including the Subcontract Work) under the Prime Contract. Subcontractor shall correct Subcontract Work whether or not installed or completed. If the Subcontract Work has been rejected, Subcontractor shall remove such rejected Subcontract Work from the Project at the direction of Contractor, and replace it with Subcontract Work that is not defective.

D. For a period of one year after substantial completion of the Prime Contract Work, and for any additional period beyond one year as required under the Prime Contract for correction by the Contractor of the Prime Contract Work, and promptly after receipt of written notice, Subcontractor shall correct all defective Subcontract Work as directed by Contractor. Subcontractor shall indemnify Contractor, Owner, Owner's engineers and consultants, for 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

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dispute resolution costs) arising out of or relating to any such correction or removal (including but not limited to all costs of repair or replacement of work of others).

E. All such correction obligations are in addition to the warranty, guarantee, and contractual duties established above and elsewhere in the Subcontract Documents.

F. The obligations under this Paragraph 8.06 will survive completion of the Subcontract Work and, when the Prime Contract is complete and ready for final payment by Owner, Contractor may assign its rights under this Paragraph 8.06 to Owner upon agreement between Owner and Contractor and notice to Subcontractor.

ARTICLE 9—CHANGES TO THE SUBCONTRACT

9.01 *Changes*

A. Without invalidating the Subcontract, Contractor may, at any time or from time to time, order changes to the Subcontract Work including additions, deletions, or revisions in the Subcontract Work. Subcontractor shall promptly proceed with the Subcontract Work as changed. All changed Subcontract Work will be performed under the applicable conditions of the Subcontract Documents. Subcontractor shall not perform any changes to the Subcontract Work that would increase the Subcontract Price or Subcontract Times without express written authority from Contractor.

B. Subcontractor shall deliver notice of each request for a change in compensation or time within 7 days of the associated directive to perform changed Subcontract Work, and not later than 2 days before Prime Contract requirements relative to submitting claims and change proposals.

C. Changes in the Subcontract Price for changed Subcontract Work will be made on the basis of either a mutually acceptable lump sum price, or under unit prices consistent with the unit prices set forth in the Subcontract as of the Subcontract Date. To the extent the changed Subcontract Work has no predetermined costs or unit prices under the original Subcontract, and the parties do not agree to a lump sum for the changed Subcontract Work, the amount of the request for changed compensation will be based upon Subcontractor's cost of labor (consistent with any applicable rates negotiated under the original Subcontract), plus the direct costs of sub-subcontracts, materials and equipment to be consumed or incorporated in the changed Subcontract Work, plus overhead and profit consistent with the price negotiated for the original Subcontract Work and subject to approval by Contractor.

D. To the extent that a change to the Subcontract Work resulted from a revision of the Prime Contract, the compensation to Subcontractor for such changed Subcontract Work will be limited to the amount collected by Contractor from Owner on behalf of Subcontractor for such change in the Subcontract Work. In the event that the revision results in a deduction of the Subcontract Price, the deduction will be based upon the share of the deduction assessed against Contractor under the Prime Contract that is attributable to the change in Subcontract Work.

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ARTICLE 10—BONDS, INSURANCE, AND INDEMNIFICATION

10.01 *Performance Bond, Payment Bond, and Other Bonds*

A. If expressly listed as Subcontract Documents in Article 13, or expressly required of Subcontractor elsewhere in the Subcontract Documents, Subcontractor shall at its expense furnish a performance bond and a payment bond, each in an amount equal to or greater than the Subcontract Price, as security for the faithful performance and payment of all of Subcontractor's obligations under the Subcontract Documents. If the Subcontract Documents as of the Subcontract Date do not require performance and payment bonds, but Contractor subsequently instructs Subcontractor to furnish such bonds, Subcontractor shall do so at Contractor's expense.

B. The performance and payment bonds must remain in effect until not less than the longer of: (1) one year after the date when final payment becomes due from Contractor; or (2) completion of the correction period specified in this Subcontract, except as provided otherwise by applicable laws or regulations. Subcontractor shall also furnish such other bonds as are required by the Subcontract Documents. The performance bond will be issued on EJCDC® C-610 Performance Bond (2018). The Payment Bond will be issued on the EJCDC® C-615 Payment Bond (2018). Terms of these bonds apply except as expressly provided otherwise by laws or regulations.

C. If the Prime Contract requires that Contractor furnish a Warranty Bond, then Subcontractor shall furnish a Warranty Bond with respect to the Subcontract Work, under the same requirements. The bond will be issued using EJCDC® C-612, Warranty Bond (2018).

D. All bonds must be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, 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.

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

F. If the surety on a bond furnished by Subcontractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Subcontractor shall promptly notify Contractor and shall, within 20 days after the event giving rise to such notification, furnish another bond and surety, both of which must comply with the bond and surety requirements above.

G. If the Subcontract requires Subcontractor to provide its own performance bond and payment bond, as described in Paragraphs 10.01.A. through D., the Contractor may, at its sole discretion, provide such bonds for the Subcontractor, either as individual instruments or as a part of Contractor's bonding. In such case Subcontractor shall be responsible to Contractor for a proportionate share of Contractor's bond costs, computed as the percentage of the total Subcontract Price relative to the total bonded Contract Price, and the Subcontract Price will be adjusted accordingly.

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H. As an alternative to requiring Subcontractor to provide or contribute to the cost of performance bonds or payment bonds as described in this Paragraph 10.01, the Contractor may, at its sole discretion, waive such requirements for this Subcontract, and the Subcontract Price will be adjusted accordingly.

I. If Subcontractor has failed to obtain a required bond, Contractor may exclude the Subcontractor from the site and exercise Contractor's termination rights under Article 11.

J. Upon request, Contractor shall provide a copy of the payment bond to any sub-subcontractor, supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Subcontract Work.

10.02 *Insurance—General Provisions*

A. Subcontractor shall obtain and maintain insurance as required in this Article and in any Subcontract exhibit or supplementary Subcontract Document regarding insurance.

B. All insurance required by the Subcontract to be purchased and maintained by Subcontractor must 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 elsewhere in the Subcontract Documents, all companies that provide insurance policies required under this Subcontract must have an A.M. Best rating of A-VII or better.

C. Subcontractor shall deliver to Contractor, with copies to each named insured and additional insured (as identified here or elsewhere in the Subcontract Documents), certificates of insurance establishing that Subcontractor has obtained and is maintaining the policies, coverages, and endorsements required by the Subcontract. Upon request by Contractor or any other insured, Subcontractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Subcontractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

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

E. If Subcontractor does not purchase or maintain all of the insurance required of it by this Subcontract, the Subcontractor shall notify Contractor in writing of such failure to purchase prior to the start of the Subcontract Work, or of such failure to maintain prior to any change in the required coverage.

F. If Subcontractor has failed to obtain and maintain required insurance, Contractor may exclude the Subcontractor from the site and exercise Contractor's termination rights under Article 11.

G. Without prejudice to any other right or remedy, if Subcontractor has failed to obtain required insurance, Contractor may elect to obtain equivalent insurance to protect Contractor's interests at the expense of Subcontractor, and the Subcontract Price will be adjusted accordingly.

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H. Contractor does not represent that insurance coverage and limits established in this Subcontract necessarily will be adequate to protect Subcontractor or Subcontractor's interests.

I. The insurance and insurance limits required herein will not be deemed as a limitation on Subcontractor's liability under the indemnities granted to Contractor and other individuals and entities in the Subcontract Documents.

10.03 *Subcontractor's Insurance*

A. *Workers' Compensation:* Subcontractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act (if applicable) and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Subcontractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Jones Act (if applicable)	
Bodily injury by accident—each accident	$
Bodily injury by disease—aggregate	$
Employer's Liability	
Each accident	$
Each employee	$
Policy limit	$
Stop-gap Liability Coverage	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	$

B. *Commercial General Liability—Claims Covered:* Subcontractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Subcontractor, on an occurrence basis, against:

1. Claims for damages because of bodily injury, sickness or disease, or death of any person other than Subcontractor's employees;

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2. Claims for 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.

C. *Commercial General Liability—Form and Content:* Subcontractor's commercial liability policy must be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance must remain in effect for three years after final payment.

b. Subcontractor shall furnish Contractor and each other additional insured (as identified in this Article or elsewhere in the Subcontract Documents) 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 Subcontractor's contractual indemnity obligations under the Subcontract Documents.

3. Severability of interest.

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); or their equivalent if Subcontractor demonstrates that the specified endorsements are not commercially available.

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.

8. If governing law invalidates or restricts the use of a specified additional insurance endorsement, then Subcontractor will furnish an endorsement that is compliant with governing law while providing reasonable protection of the interests of the additional insureds.

D. *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 Subcontractor 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).

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6. Any limitation or exclusion based on the nature of Subcontractor's work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

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

E. *Automobile Liability:* Subcontractor shall purchase and maintain automobile liability insurance against claims 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	$
Each Accident	$
Property Damage	
Each Accident	$
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$

F. *Umbrella or Excess Liability:* Subcontractor 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	$
General Aggregate	$

G. *Subcontractor's Pollution Liability Insurance:* Subcontractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result of pollution conditions arising from Subcontractor's operations and completed operations. The completed operations coverage must remain in effect for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	$
General Aggregate	$

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H. *Additional Insureds:* The Subcontractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, and pollution liability policies must include and list as additional insureds Contractor, Owner, and Owner's engineers, architects, and consultants, and any individuals or entities identified as additional insureds elsewhere in the Subcontract Documents; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds must provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Subcontractor shall obtain all necessary endorsements to support these requirements.

I. *Subcontractor's Professional Liability Insurance:* If Subcontractor will provide or furnish professional services under this Subcontract, through a delegation of professional design services or otherwise, then Subcontractor 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 Subcontract and for a minimum of two years after Substantial Completion of the Project. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

J. *General provisions:* The policies of insurance required by this Paragraph 10.03 must:

1. include at least the specific coverages provided in this Subcontract.

2. be written for not less than the limits of liability expressly provided in this Subcontract, including any Subcontract exhibit or supplementary Subcontract Document specifying insurance policy limits, or if no such express insurance limits are set forth in the Subcontract, then for not less than the limits required of Contractor by Owner in the Prime Contract, for the corresponding types of insurance. If laws or regulations require a higher limit, then Subcontractor shall meet such legal requirement.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 10 days prior written notice has been given to Subcontractor. Within three days of receipt of any such written notice, Subcontractor shall provide a copy of the notice to Contractor and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required herein) and at all times thereafter when Subcontractor may be correcting, removing, or replacing defective Subcontract Work as a warranty or correction obligation, or otherwise, or returning to the site to conduct other tasks arising from the Subcontract Documents.

5. be appropriate for the Subcontract Work being performed and provide protection from claims that may arise out of or result from Subcontractor's performance of the Subcontract Work and Subcontractor's other obligations under the Subcontract Documents, whether it is to be performed by Subcontractor, any lower-tier subcontractor or supplier, or by anyone directly or indirectly employed by any of them to perform any of the Subcontract Work, or by anyone for whose acts any of them may be liable.

K. Subcontractor waives all rights against Owner, Contractor, and all individuals or entities identified in the Prime Contract's Supplementary Conditions to be listed as insureds or

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additional insureds under the builder's risk, installation floater, or other forms of property insurance, and against the Owner's engineers and consultants, and their 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 any of the perils or causes of loss covered by such builder's risk, installation floater, or other form of property insurance applicable to the work under the Prime Contract; and Contractor waives all rights against Subcontractor for all such losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such builder's risk, installation floater, or other form of property insurance applicable to the work under the Prime Contract.

L. If Contractor is responsible under the Prime Contract and any builder's risk or other property insurance policy for the payment of a deductible, or an amount within a deductible, and the need to pay such deductible or amount within a deductible is attributable in whole or part to the actions or inactions of Subcontractor, its sub-subcontractors, employees, agents, or others for which Subcontractor is responsible, then Subcontractor shall pay its attributable share of such deductible.

M. Upon request the Contractor shall provide to Subcontractor a copy of any builder's risk, installation floater, or other property insurance policy applicable to the work under the Prime Contract. Contractor may block out (redact) any confidential premium or pricing information contained in any such policy. Subcontractor may elect to obtain other insurance at its expense, if it concludes that its interests are not insured under such policy.

N. *Other Required Insurance:* [Identify any other policies that Subcontractor must obtain and maintain, such as railroad protective liability insurance].

10.04 *Indemnification*

A. To the fullest extent permitted by laws and regulations, Subcontractor shall indemnify and hold harmless Contractor, Owner, and Owner's engineers and consultants, 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 performance of the Subcontract Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Subcontract Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Subcontractor, any lower tier subcontractor, supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Subcontract Work or anyone for whose acts any of them may be liable.

B. In addition to the indemnification obligations in the preceding paragraph, Subcontractor shall indemnify Contractor for all economic costs and expenses, including attorney's fees, for any claim against Contractor as a result of and to the extent caused by Subcontractor's breach of any obligation under the Subcontract.

C. In any and all claims against Contractor, Owner, or Owner's engineers or consultants, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such

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employee) of Subcontractor, any lower tier subcontractor, any supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Subcontract Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 10.04.A. must not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Subcontractor, lower-tier subcontractor, supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

D. With respect to the Subcontract Work, the breach of obligations under the Subcontract, and any negligent act or omission of Subcontractor, any lower tier subcontractor, supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Subcontract Work, or anyone for whose acts any of them may be liable, and to the fullest extent permitted by law, Subcontractor assumes the same or corresponding responsibilities as Contractor for indemnity obligations set forth in the Prime Contract.

ARTICLE 11—SUSPENSION AND TERMINATION

11.01 *Contractor May Suspend Work*

A. In the event that Owner suspends the work of Contractor under the Prime Contract, Contractor may suspend the performance of the Subcontract or any portion thereof for a period of not more than 90 consecutive days, by giving notice in writing to Subcontractor of such suspension. Subcontractor shall resume the Subcontract Work when instructed by Contractor to do so. Subcontractor shall be granted an adjustment in the Subcontract Price or an extension of the Subcontract Times, or both, directly attributable to any such suspension only to the extent that Contractor receives an adjustment of the Prime Contract price or the Prime Contract time for the Subcontractor's proportionate share of work under the Prime Contract.

B. Contractor may suspend the Subcontract Work for a period of not more than 90 days, or to the extent permitted by the progress schedule or any express provision of the Subcontract Documents, for Contractor's own purposes.

C. Contractor may suspend the work of Subcontractor with all costs and liability for any delay in the Subcontract Work and others to be assessed against the Subcontractor for the following Subcontract violations until the Subcontractor demonstrates it has cured the violations as follows:

1. Subcontractor fails to comply with the Owner's or Contractor's safety program;
2. Subcontractor or its employees are in violation of OSHA or state or local safety laws or regulations;
3. Subcontractor has installed defective Subcontract Work that is not in compliance with the Subcontract Documents and has failed to cure the defective Subcontract Work;
4. Subcontractor has violated any laws or regulations applicable to the performance of the Subcontract Work; and
5. Subcontractor has failed to pay a supplier or lower-tier subcontractor pursuant to Subcontractor's legal or contractual obligations.

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D. If Subcontractor fails to comply with the progress schedule, causing delay to the Subcontract Work or the Prime Contract work, after three days' notice by Contractor and failure of Subcontractor to demonstrate that it has implemented procedures to comply with the schedule through measures such as providing supplemental labor, materials, and tools, then Contractor may implement its own procedures to meet the schedule, by providing supplemental labor, materials, tools, or taking other measures, through its own or other forces, and Contractor may assess the cost of such supplemental procedures against the Subcontract.

11.02 *Contractor May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Subcontractor's persistent failure to perform the Subcontract Work in accordance with the Subcontract Documents (including, but not limited to, failure to supply sufficient skilled workers, suitable materials, or equipment, or failure to adhere to the Subcontract progress schedule);

2. Subcontractor's disregard of laws or regulations of any public body having jurisdiction;

3. Subcontractor's repeated disregard of the authority of Contractor; or

4. Subcontractor's failure to perform or otherwise to comply with a material term of the Subcontract.

B. If one or more of the events identified in the preceding paragraph occur, Contractor may, after giving Subcontractor 7 days written notice of its intent to terminate the services of Subcontractor, or in the event the Subcontractor provided a performance bond covering the Subcontract the Contractor may provide notice to the Subcontractor and surety in accordance with the requirements of the applicable performance bond of its intent to terminate the services of Subcontractor to preserve Contractor's rights under the performance bond. Upon termination of the Subcontract, Contractor may:

1. exclude Subcontractor from the site, and take possession of the Subcontract Work;

2. incorporate in the Subcontract Work all materials and equipment stored at the site, or for which Contractor has paid Subcontractor but which are stored elsewhere; and

3. complete the Subcontract Work as Contractor may deem expedient.

C. If Contractor proceeds as provided in Paragraph 11.02.B., Subcontractor shall not be entitled to receive any further payment until the Subcontract Work is completed. If the unpaid balance of the Subcontract Price exceeds 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) sustained by Contractor arising out of or relating to completing the Subcontract Work, such excess will be paid to Subcontractor. If such claims, costs, losses, and damages exceed such unpaid balance, Subcontractor shall pay the difference to Contractor. When exercising any rights or remedies under this paragraph, Contractor shall not be required to obtain the lowest price for the Subcontract Work performed.

D. Notwithstanding Paragraphs 11.02.A. and 11.02.B., Subcontractor's services will not be terminated if Subcontractor begins within four days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more

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than 14 days of receipt of said notice. If the Subcontractor fails to cure within 14 days of receipt of said notice, the Subcontract will be deemed terminated in accordance with provisions 11.02.A through 11.02.C upon two days' notice by the Contractor following the 14-day period.

E. Where Subcontractor's services have been so terminated by Contractor, the termination will not affect any rights or remedies of Contractor against Subcontractor then existing or which may thereafter accrue. Any retention or payment of money due Subcontractor by Contractor will not release Subcontractor from liability.

F. If and to the extent that Subcontractor has provided a performance bond, the termination procedures of that bond will supersede the procedures in this Paragraph 11.02.

11.03 *Termination of Contractor or Rejection of Subcontract by Owner*

A. The Contractor may terminate the Subcontract at any time, if the Prime Contract is terminated by the Owner, or if Owner rejects the Subcontract in accordance with the terms of the Prime Contract, the Contractor may terminate the Subcontract without penalty.

B. In the event of a termination pursuant to Paragraph 11.03, the costs and expenses to be paid to Subcontractor resulting from a termination under this provision must be limited to the costs and expenses recovered by Contractor from Owner on Subcontractor's behalf.

11.04 *Contractor May Terminate for Convenience*

A. Upon 7 days written notice to Subcontractor, Contractor may, without cause and without prejudice to any other right or remedy of Contractor, terminate the Subcontract. In such case, Subcontractor shall be paid for (without duplication of any items):

1. Completed and acceptable Subcontract Work executed in accordance with the Subcontract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Subcontract Work;

2. Expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Subcontract in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. Reasonable expenses directly attributable to termination.

B. Subcontractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

11.05 *Subcontractor May Stop Work or Terminate*

A. If, through no act or fault of Subcontractor, Contractor after receipt of payment from Owner fails to make payment due Subcontractor, for more than 30 days after payment is due, then Subcontractor may, upon 7 days written notice to Contractor, and provided Contractor does not remedy such failure within 7 days thereafter, terminate the Subcontract and recover payment from Contractor subject to the terms of this Subcontract.

B. As an alternative to terminating the Subcontract and without prejudice to any other right or remedy, if a payment owed to Subcontractor is more than 30 days past due, then Subcontractor may, 7 days after written notice to Contractor, stop the Subcontract Work until payment is made of all such amounts due Subcontractor, including interest thereon at an

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annual rate of five percent per annum, or if applicable at the rate prescribed by law, without penalty.

C. If the Contractor suspends the Subcontractor's work for more than 120 days, the Subcontractor may upon 7 days' written notice terminate the Subcontract and recover the amounts due the Subcontractor for Subcontract Work completed as of the date of termination, including retainage withheld from the Subcontractor to date and interest thereon at an annual rate of five percent per annum, or if applicable at the rate prescribed by law, without penalty.

ARTICLE 12—CLAIMS AND DISPUTE RESOLUTION

12.01 *Claims*

A. As a condition precedent to any consideration, pursuit, or recovery by Subcontractor of any change proposal, request, demand, or claim (collectively referred to as "Claim") seeking an increase in Subcontract Price, Subcontract Time, or both, Subcontractor shall provide notice of any such Claim to Contractor no less than 30 days after the event giving rise to the Claim, and for Claims related in any way to the Owner or Prime Contract, within five days.

B. Subcontractor's recovery of additional cost, time, or both cost and time for any Claim attributable to the Owner will be limited to the proportionate recovery by Contractor against Owner for such Claim. Subcontractor will cooperate and assist Contractor in pursuing any Claim by Contractor against Owner on behalf of Subcontractor, including the timely preparation and delivery of supporting documentation.

C. If the pursuit of any Claim by Contractor against Owner on Subcontractor's behalf requires the expenditure by Contractor of legal or consulting fees, or results in litigation, arbitration, or any dispute resolution procedures, Subcontractor agrees to pay for a proportionate share of attorneys' fees, consultant fees, and litigation, arbitration, and other resolution costs incurred by Contractor in pursuing the claim on behalf of Subcontractor, based upon the amount claimed by Subcontractor as compared to the total value of the claim pursued by the Contractor.

D. Except as provided by applicable lien, bond, or prompt payment laws, Subcontractor shall not make any direct claims against Owner for compensation or additional compensation for performance of the Subcontract Work.

12.02 *Dispute Resolution*

A. Either Contractor or Subcontractor may request mediation of any dispute between Contractor and Subcontractor in connection with this Subcontract that has not been settled to their mutual satisfaction within the applicable notice or cure periods provided in this Subcontract, or that Contractor has not pursued against Owner as described above. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Subcontract Date. The request for mediation must be submitted in writing to the American Arbitration Association and the other party to this Subcontract.

B. Contractor and Subcontractor shall participate in the mediation process in good faith. The process must be concluded within 60 days of filing of the request. The date of termination of the mediation must be determined by application of the mediation rules referenced above.

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C. If the dispute is not resolved by mediation, each party to this Subcontract shall be barred from further action to assert its claim after 30 days after termination of the mediation unless, within that time period, Contractor or Subcontractor:

1. elects in writing to invoke any dispute resolution procedure expressly provided for in a Subcontract exhibit or elsewhere in the Subcontract Documents; or
2. agrees with the other party to submit the dispute to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the claim to a court of competent jurisdiction.

D. If Contractor is engaged in an arbitration with Owner that relates, in whole or in part, to a dispute between Contractor and Subcontractor, then Contractor shall have the sole and exclusive discretion to join Subcontractor as a party to the Contractor-Owner arbitration. Subcontractor consents to the jurisdiction of any such arbitration proceeding to which it is joined pursuant to this provision.

ARTICLE 13—SUBCONTRACT DOCUMENTS

13.01 *Subcontract Contents*

A. The Subcontract Documents consist of the following:

1. This Subcontract.
2. Prime Contract, with the exception of confidential terms. The following portions of the Prime Contract are attached as Exhibit A:
    a. General Conditions.
    b. Supplementary Conditions.
    c. Specifications, Division 01.
    d. [Other Specification sections].
    e. [Drawings; incorporate by reference if not attached].
    f. [Other Prime Contract items].
3. [Subcontract scope of Subcontract Work exhibit].
4. [Requirements for Subcontractor's insurance—limits, deductibles, special endorsements, etc.]
5. Subcontract performance bond. [Delete if not required].
6. Subcontract payment bond. [Delete if not required].
7. Subcontractor's bid or proposal. [Include as Subcontract Document only if necessary to avoid substantial rekeying of critical price or other information].
8. Subcontract dispute resolution procedures, if any. [Delete if not required].
9. Other exhibits to this Subcontract (enumerated as follows): [Identify such other exhibits].

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10. The following which may be delivered or issued on or after the Subcontract Date and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.
    e. Warranty Bond, if any.

Notes to User—Revise or supplement the list above to suit the specific needs of this Subcontract.

B. The documents listed in the paragraph above are attached to this Subcontract (except as expressly noted otherwise above).

C. There are no Subcontract Documents other than those listed above in this Article 14. The Subcontract supersedes prior negotiations, representations, and agreements regarding the Subcontract Work, whether written or oral.

D. The Subcontract Documents may only be amended, modified, or supplemented by written agreement of Contractor and Subcontractor.

ARTICLE 14—MISCELLANEOUS

14.01 *Terms*

Terms used in this Subcontract will have the meanings stated here, or in the Prime Contract's General Conditions and Supplementary Conditions.

14.02 *Assignment of Subcontract*

No assignment by Subcontractor of any rights under or interests in the Subcontract will be binding on Contractor without Contractor's written consent; and, specifically but without limitation, payments that may become due and money that is due may not be assigned by Subcontractor 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 Subcontract Documents.

14.03 *Successors and Assigns*

Contractor and Subcontractor 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 Subcontract Documents.

14.04 *Severability*

Any provision or part of the Subcontract Documents held to be void or unenforceable under any law or regulation will be deemed stricken, and all remaining provisions must continue to be valid and binding upon Contractor and Subcontractor, which agree that the Subcontract 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.

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ARTICLE 15—SUBCONTRACTOR'S REPRESENTATIONS AND CERTIFICATIONS

15.01 *Subcontractor's Representations*

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

1. Subcontractor has examined and carefully studied the Subcontract Documents, and any data and reference items identified in the Subcontract Documents, including but not limited to initial schedules identified by Contractor.

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

3. Subcontractor is familiar with and is satisfied as to all laws and regulations that may affect cost, progress, and performance of the Subcontract Work.

4. Subcontractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the site and drawings of physical conditions relating to existing surface or subsurface structures at the site that have been identified by the Prime Contract or Subcontract, especially with respect to technical data in such reports and drawings.

5. Subcontractor has carefully studied reports and drawings of hazardous environmental conditions, if any, at or adjacent to the site that have been identified in the Prime Contract or Subcontract, especially with respect to technical data in such reports and drawings.

6. Subcontractor has considered the information known to Subcontractor itself; information commonly known to contractors and subcontractors doing business in the locality of the site; information and observations obtained from visits to the site; the Subcontract Documents; and the site-related reports and drawings, if any, identified in the Prime Contract or Subcontract, with respect to the effect of such information, observations, and documents on (a) the cost, progress, and performance of the Subcontract Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Subcontractor; and (c) Subcontractor's safety precautions and programs.

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

8. Subcontractor is aware of the general nature of work to be performed by Owner, Contractor, other subcontractors, and others at the site that relates to the Subcontract Work as indicated in the Subcontract Documents.

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

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

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

15.02 *Subcontractor's Certifications*

A. Subcontractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Subcontract. For the purposes of this paragraph:

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 Subcontract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Subcontract to the detriment of Owner or Contractor, (b) to establish bid or Subcontract prices at artificial non-competitive levels, or (c) to deprive Owner or Contractor 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 or Contractor, 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 Subcontract.

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IN WITNESS WHEREOF, Contractor and Subcontractor have signed this Subcontract.

The Effective Date of the Subcontract is [date to be inserted at the time of execution].

Contractor:	Subcontractor:
_____ *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Date: _____ *(date signed)*	Date: _____ *(date signed)*
	(If Subcontractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices:	Address for giving notices:
_____	_____
_____	_____
Designated Representative:	Designated Representative:
Name: _____ *(typed or printed)*	Name: _____ *(typed or printed)*
Title: _____ *(typed or printed)*	Title: _____ *(typed or printed)*
Address:	Address:
_____	_____
_____	_____
Phone: _____	Phone: _____
Email: _____	Email: _____
(If Contractor or Subcontractor is a corporation, attach evidence of authority to sign.	License No.: _____ *(where applicable)*
	State: _____

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NOTICE TO PROCEED

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

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

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

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

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

[or]

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

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

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

Owner:	Mountain Green Sewer Improvement District
By *(signature)*:	
Name *(printed)*:	
Title:	
Date Issued:	

Copy: Engineer

EJCDC® C-550, Notice to Proceed.
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PERFORMANCE BOND

Contractor Name: [Full formal name of Contractor] Address *(principal place of business)*: [Address of Contractor's principal place of business]	Surety Name: [Full formal name of Surety] Address *(principal place of business)*: [Address of Surety's principal place of business]
Owner Name: Mountain Green Sewer Improvement District Mailing address *(principal place of business)*: 5455 W. Old Highway Road Morgan, Utah 84050	Contract Description *(name and location)*: BNR Wastewater Treatment Plant, 5455 W. Old Highway Road Morgan, Utah 84050 Contract Price: [Amount from Contract] Effective Date of Contract: [Date from Contract]
Bond Bond Amount: [Amount] Date of Bond: [Date] *(Date of Bond cannot be earlier than Effective Date of Contract)* Modifications to this Bond form: ☐ None ☐ See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal _____ *(Full formal name of Contractor)* By: _____ *(Signature)* Name: _____ *(Printed or typed)* Title: _____ Attest: _____ *(Signature)* Name: _____ *(Printed or typed)* Title: _____	Surety _____ *(Full formal name of Surety) (corporate seal)* By: _____ *(Signature)(Attach Power of Attorney)* Name: _____ *(Printed or typed)* Title: _____ Attest: _____ *(Signature)* Name: _____ *(Printed or typed)* 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 is considered plural where applicable.	

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

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

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

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

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

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

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

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

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

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

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

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

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

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

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

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

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

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

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

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

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

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

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

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

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

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statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

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

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

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

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

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

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

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

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WARRANTY BOND

Contractor Name: [Full formal name of Contractor] Address *(principal place of business)*: [Address of Contractor's principal place of business]	Surety Name: [Full formal name of Surety] Address *(principal place of business)*: [Insert address of Surety's principal place of business]
Owner Name: Mountain Green Sewer Improvement District Address *(principal place of business)*: 5455 W. Old Highway Road Morgan, Utah 84050	Construction Contract Description *(name and location)*: BNR Wastewater Treatment Plant, 5455 W. Old Highway Road Morgan, Utah 84050 Contract Price: [Amount from Contract] Effective Date of Contract: [Date from Contract] Contract's Date of Substantial Completion: [Date from Contract]
Bond Bond Amount: [Amount] Date of Bond: [Date] Modifications to this Bond form: ☐ None ☐ See Paragraph 9	Bond Period: Commencing 364 days after Substantial Completion of the Work under the Construction Contract, and continuing until [insert number of years, typically either two or three] years after such Substantial Completion.

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

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

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

EJCDC® C-612, Warranty Bond.
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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract's Correction Period Obligations. The Construction Contract is incorporated herein by reference.
2. If the Contractor performs the Correction Period Obligations, the Surety and the Contractor shall have no obligation under this Warranty Bond.
3. If Owner gives written notice to Contractor and Surety during the Bond Period of Contractor's obligation under the Correction Period Obligations, and Contractor does not fulfill such obligation, then Surety shall be responsible for fulfillment of such Correction Period Obligations. Surety shall either fulfill the Correction Period Obligations itself, through its agents or contractors, or, in the alternative, Surety may waive the right to fulfill the Correction Period Obligations itself, and reimburse the Owner for all resulting costs incurred by Owner in performing Contractor's Correction Period Obligations, including but not limited to correction, removal, replacement, and repair costs.
4. The Surety's liability is limited to the amount of this Warranty Bond. Renewal or continuation of the Warranty Bond will not modify such amount, unless expressly agreed to by Surety in writing.
5. The Surety shall have no liability under this Warranty Bond for obligations of the Contractor that are unrelated to the Construction Contract. No right of action will accrue on this Warranty Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
6. Any proceeding, legal or equitable, under this Warranty 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 must be instituted within two years after the Surety refuses or fails to perform its obligations under this Warranty Bond.
7. Written notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown in this Warranty Bond.
8. Definitions

    8.1. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page of this Warranty Bond, including all Contract Documents and changes made to the agreement and the Contract Documents.

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

    8.3. *Correction Period Obligations*—The duties, responsibilities, commitments, and obligations of the Contractor with respect to correction or replacement of defective Work, as set forth in the Construction Contract's Correction Period clause, EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), Paragraph 15.08, as duly modified.

    8.4. *Substantial Completion*—As defined in the Construction Contract.

    8.5. *Work*—As defined in the Construction Contract.
9. Modifications to this Bond are as follows: [Describe modification or enter "None"]

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PAYMENT BOND

Contractor	Surety
Name: [Full formal name of Contractor] Address *(principal place of business)*: [Address of Contractor's principal place of business]	Name: [Full formal name of Surety] Address *(principal place of business)*: [Address of Surety's principal place of business]
Owner	**Contract**
Name: Mountain Green Sewer Improvement District Mailing address *(principal place of business)*: 5455 W. Old Highway Road Morgan, Utah 84050	Description *(name and location)*: BNR Wastewater Treatment Plant, 5455 W. Old Highway Road Morgan, Utah 84050 Contract Price: [Amount, from Contract] Effective Date of Contract: [Date, from Contract]

Bond

Bond Amount: [Amount]

Date of Bond: [Date]

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

Modifications to this Bond form:

☐ None ☐ See Paragraph 18

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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

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

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

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

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

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

16. Definitions

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

        16.1.1. The name of the Claimant;

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

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

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

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

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

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

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

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

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

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

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

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

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

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CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:
Engineer:
Contractor:
Project:
Contract Name:

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

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

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

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

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

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

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

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

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

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

[List amendments to Owner's Responsibilities]

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

[List amendments to Contractor's Responsibilities]

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

[List attachments such as punch list; other documents]

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

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

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NOTICE OF ACCEPTABILITY OF WORK

Owner: Owner's Project No.:
Engineer: Engineer's Project No.:
Contractor: Contractor's Project No.:
Project:
Contract Name:
Notice Date: Effective Date of the Construction Contract:

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated [date of professional services agreement] ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

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

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

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

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

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

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

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

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

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

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

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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

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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.

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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.

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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.

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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.

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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

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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.

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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

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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.

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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 365 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 365th day after the day of Bid opening or the 365th 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

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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.

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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.

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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

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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.

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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

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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;

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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

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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

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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

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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

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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

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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.

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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);

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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

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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.

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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.

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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;

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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

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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.

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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

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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.

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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:

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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.

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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

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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

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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

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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

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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.

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g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

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

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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

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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.

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D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

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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,

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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

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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.

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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;

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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

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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

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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.

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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,

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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.

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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,

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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

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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.

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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.

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SUPPLEMENTARY CONDITIONS

THESE SUPPLEMENTARY CONDITIONS AMEND OR SUPPLEMENT THE STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT, EJCDC® C-700 (2013 EDITION). ALL PROVISIONS THAT ARE NOT SO AMENDED OR SUPPLEMENTED REMAIN IN FULL FORCE AND EFFECT.

THE TERMS USED IN THESE SUPPLEMENTARY CONDITIONS HAVE THE MEANINGS STATED IN THE GENERAL CONDITIONS. ADDITIONAL TERMS USED IN THESE SUPPLEMENTARY CONDITIONS HAVE THE MEANINGS STATED BELOW, WHICH ARE APPLICABLE TO BOTH THE SINGULAR AND PLURAL THEREOF.

THE ADDRESS SYSTEM USED IN THESE SUPPLEMENTARY CONDITIONS IS THE SAME AS THE ADDRESS SYSTEM USED IN THE GENERAL CONDITIONS, WITH THE PREFIX "SC" ADDED THERETO.

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

SC-1.01 Defined Terms

SC-1.01 Add the following terms in their appropriate alphabetical location to the list of defined terms in the General Conditions:

1. Agreement Supplement – A written instrument executed by Owner and Bidder in the time period between the opening of Bids and the signing of the Agreement which clarifies, corrects or changes the Contract Documents.

2. Asbestos – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

3. Bid Documents – Bidding Documents as defined in the General Conditions.

4. Bid Security – Bid bond, cashier's check, or cash in an amount equal to a minimum of five (5) percent of the Bid price.

5. Bonds – Bid, performance and payment Bonds, cash, cashier's or certified bank check and other instruments of security.

6. Claimant – An individual or entity having a direct contract with Contractor or with a Subcontractor or Supplier of Contractor to furnish labor, materials, supplies or equipment for use in the performance of the Work. The intent of this definition shall be to include without limitation in the terms "labor, materials, supplies or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Work, architectural and engineering services required for performance of the work of Contractor and Contractor's Subcontractors, and all other items for which a claim may be asserted where the labor, materials, supplies or equipment were furnished.

7. Construction Contract – Contract as defined in the General Conditions.

8. CONTRACTOR – Contractor as defined in the General Conditions.

9. Day – Any 24 hour period measured from mid-night to the next mid-night.

10. Defective – An adjective which when modifying the word "work" refers to work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any Inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged before Engineer's Final Inspection (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion).

11. Effective Date of the Construction Contract – Effective Date of the Contract as defined in the General Conditions.

12. ENGINEER – Engineer as defined in the General Conditions.

13. Final Inspection – An Inspection of the Work (or agreed-to portion), conducted by Engineer, after Work (or agreed-to portion) is Substantially Complete.

14. General Requirements – Sections of Division 1 of the Standard Specifications and Specifications.

15. Hazardous Waste – The term hazardous waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

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16. Incidental Work – Any work, materials, time, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result of the Work.

17. Inspection – The term "inspection" or its derivatives means a review of the Project, including but not limited to a visual review of the work completed to date. It does not include or imply an exhaustive or detailed review of the Work, nor does it create a duty on the part of Engineer or Owner to detect latent defects.

18. Lump Sum Work – Work to be paid for on the basis of a stipulated price.

19. Major Unit Price Item of Work – Any item of Unit Price Work which has a total value greater than five (5) percent of the initial Contract Price.

20. Modification – Any Addendum, Agreement Supplement, Change Order, or Work Directive Change.

21. Notice of Intent to Award – Notice of Award as defined in the General Conditions.

22. OWNER – Owner as defined in the General Conditions.

23. Partial Utilization – Placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

24. PCBs – Polychlorinated biphenyl.

25. Petroleum – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 deg. Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

26. Plans – Drawings as defined in the General Conditions.

27. Punch List – the list of unacceptable, incorrectly accomplished, damaged or unfinished work items compiled by Engineer at Final Inspection.

28. Punch List Time – The number of Days specified in the Agreement for the completion of the Final Inspection Punch List Work.

29. Radioactive Material – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

30. Special Provisions - 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, which are in addition to and supersede the Standard Specifications.

31. Standard Plans – The graphical and text displays contained in the APWA Manual of Standard Plans, 2013 Edition, As Amended and Supplemented, published by the Utah LTAP Center, Utah State University, Logan, UT.

32. Standard Specifications - The specifications contained in the APWA Manual of Standard Specifications, 2013 Edition, As Amended and Supplemented, published by the Utah LTAP Center, Utah State University, Logan, UT, not including Section 00 72 00 General Conditions.

33. Work Completion – The Work and all contractual obligations under the Contract Documents have been fulfilled and when final payment is due.

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34. Work Directive Change – Work Change Directive as defined in the General Conditions.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01 Intent

SC-3.01 Add the following new paragraphs immediately after Paragraph 3.01.E:

F. The Specifications may vary in form, format and style. Some specification sections are written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omissions of such words and phrases as "the Contractor shall", "in conformity with", "as shown", or "as specified" are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the section. Contractor shall not take advantage of any variation of form, format or style in making claims for extra Work.

G. The cross referencing of specification sections under the subparagraph heading "Related Sections include but are not necessarily limited to:" and elsewhere within each specification section is provided as an aid and convenience to Contractor. Contractor shall not rely on the cross referencing provided and shall be responsible to coordinate the entire Work under the Contract Documents and provide a complete Project whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Subsurface and Physical Conditions

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

C. The following reports of explorations and tests of subsurface conditions at or adjacent to the Site are known to Owner:

1. Report dated *[May 21, 2013, prepared by Aye and Bea, Consulting Engineers, Philadelphia, Pa., entitled: "Results of Investigation of Subsoil Conditions and Professional Recommendations for Foundations of Iron Foundry at South and Front Streets, Pembrig, NJ", consisting of 42 pages.]* The Technical Data contained in such report upon whose accuracy Contractor may rely are those indicated in the definition of Technical Data in the General Conditions.]

D. A copy of the report identified in SC 5.03.C is included as Appendix A in the Contract Documents.

SC-5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

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ARTICLE 6 – BONDS AND INSURANCE

SC-6.03 Contractor's Liability Insurance

SC-6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:	Statutory
Federal, if applicable (e.g., Longshoreman's):	Statutory
Employer's Liability:	
Bodily injury, each accident	$ 1,000,000
Bodily injury by disease, each employee	$ 1,000,000
Bodily injury/disease aggregate	$ 2,000,000
Foreign voluntary worker compensation	Statutory

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	$ 2,000,000
Products - Completed Operations Aggregate	$ 2,000,000
Personal and Advertising Injury	$ 1,000,000
Each Occurrence (Bodily Injury and Property Damage)	$ 1,000,000

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:	
Each person	$ 1,000,000
Each accident	$ 1,000,000
Property Damage:	
Combined Single Limit of	$ 1,000,000

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4. Excess or Umbrella Liability:

Per Occurrence	$ 1,000,000
General Aggregate	$ 1,000,000

5. Contractor's Pollution Liability:

Each Occurrence	$ Not Applicable
General Aggregate	$ Not Applicable

☒ If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract

6. Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following: *[Here list by name (not category, role, or classification) other persons or entities to be included on the commercial general liability, automobile liability, umbrella or excess, and pollution liability policies as additional insureds.]*

7. Contractor's Professional Liability:

Each Claim	$ 1,000,000
Annual Aggregate	$ 2,000,000

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

SC-7.01 Supervision and Superintendence

SC-7.01.B. Amend Paragraph 7.01.B to add the following sentences: "The Contractor shall identify their representative at the Site that shall have authority to act on behalf of Contractor. All communications given to or received from this representative shall be binding on Contractor.

SC-7.02 Labor; Working Hours

SC-7.02.B. Add the following new subparagraphs immediately after Paragraph 7.02.B:

1. Regular working hours will be 8:00 A.M. to 5:00 P.M., local time.

2. Legal holidays shall be construed to mean those observed by Owner.

SC-7.03 Services, Materials, and Equipment

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

1. Where the Work requires equipment be furnished, due to the lack of standardization of equipment as produced by the various manufacturers, it may become necessary to make minor modifications in the structures, buildings, piping, mechanical work, electrical work, accessories, controls, or other work, to accommodate the particular equipment offered. Contractor's bid price for any equipment offered shall include the cost of making any necessary changes subject to the approval of Engineer.

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SC-7.09 Taxes

SC-7.09 Add a new paragraph immediately after Paragraph 7.09.A:

B. Owner may be exempt from payment of sales and compensating use taxes of the State of Utah and of cities and counties thereof on all materials to be incorporated into the Work.

1. If this is the case, Owner will furnish the required certificates of tax exemption to Contractor for use in the purchase of supplies and materials to be incorporated into the Work.

2. Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Project Representative

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

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:

a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:

a. Record date of receipt of Samples and Contractor-approved Shop Drawings.

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b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. Review of Work and Rejection of Defective Work:

a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. Records:

a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

c. Maintain records for use in preparing Project documentation.

11. Reports:

a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

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c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. Completion:

a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall 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 Contractor's work.

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. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

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

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ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN WORK

SC-11.05 Change of Contract Times

SC-11.05 Add the following new paragraph after Paragraph 11.05.B:

C. Time extensions will not be granted for rain, wind, flood, or other natural phenomena of normal intensity for the locality where the Work is performed. For the purpose of determining the extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for a minimum continuous period of at least one-fourth of the Contract Time involved with the average of the preceding 5-year climatic range during the same time interval based on U.S. Weather bureau statistics for the locality where the Work is performed.

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

SC-15.03 Substantial Completion

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

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, shall 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 Article 15.

SC-15.07 Waiver of Claims

SC-15.07.B Amend Paragraph 15.07.B to read as follows:

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

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.03 Attorneys' Fees

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01:

SC-17.02 Attorneys' Fees: For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

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

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

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

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

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

Notes to User—Check one or both of the following

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

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

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

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

Basis of estimated change in Contract Price:

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

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

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CHANGE ORDER NO.: [Number of Change Order]

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

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

Description:

[Description of the change]

Attachments:

[List documents related to the change]

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

Recommended by Engineer (if required)	Authorized by Owner
By: _____	_____
Title: _____	_____
Date: _____	_____

Authorized by Owner	Approved by Funding Agency (if applicable)
By: _____	_____
Title: _____	_____
Date: _____	_____

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FIELD ORDER NO.: [Number of Field Order]

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

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

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

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MOUNTAIN GREEN SEWER IMPROVEMENT DISTRICT
TECHNICAL SPECIFICATIONS

5455 W Old Hwy Rd
Morgan, UT 84050

JANUARY 2022

PREPARED BY:
Sunrise Engineering, Inc.

Section No. of Pages

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00700.1 DEFINITIONS

Wherever used in the Contract Documents, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

ADDENDA - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Drawings, and Specifications, by additions, deletions, clarifications, or corrections.

AGREEMENT OR CONSTRUCTION CONTRACT AGREEMENT - The written contract between the Owner and the Contractor covering the work to be performed; other Contract Documents are attached to the Agreement and made part thereof as provided therein.

BID - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

BIDDER - Any person, firm, or corporation submitting a bid for the Work.

BONDS - Bid, Performance, and Payment Bonds and other instruments of security, furnished by the Contractor and its surety in accordance with the Contract Documents.

CHANGE ORDER - A written order to the Contractor authorizing an addition, deletion, or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

CONTRACT DOCUMENTS - The contract, including Advertisement for Bids (or notice to Contractors of Intention to Receive Bids). Instructions to Bidders, Bid, Bid Bond, Agreement, Payment Bond, Performance Bond, Notice of Award, Notice to Proceed, Change Order, Drawings, Specifications, Supplemental Instructions, Special Provisions and Addenda.

CONTRACT PRICE - The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

CONTRACT TIME - The number of calendar days stated in the Contract Documents for the completion of the Work.

CONTRACTOR - The person, firm, or corporation with whom the Owner has executed the Agreement.

DRAWINGS - The part of the Contract Documents which show the characteristics and scope of the Work to be performed and which have been prepared or approved by the Engineer.

ENGINEER - Sunrise Engineering, Inc.

FIELD ORDER - A written order effecting a change in the Work not involving a material adjustment in the Contract Price or an extension of the Contract Time, issued by the Engineer to the Contractor during construction.

NOTICE OF AWARD - The written notice of acceptance of a bid, from the Owner to the successful Bidder, which also sets the time in which the Contract must be signed.

NOTICE TO PROCEED - Written communication issued by the Owner to the Contractor authorizing the Contractor to proceed with the Work and establishing the date of commencement and completion of the Work.

OWNER - A public or quasi-public body or authority, corporation, association, partnership, or individual for whom the Work is to be performed.

PROJECT – Synonymous with The Work, i.e., the total construction to be provided under the Contract Documents which may be the whole or a part as indicated elsewhere in the Contract Documents.

RESIDENT PROJECT REPRESENTATIVE - The authorized representative of the Owner who is assigned to the Project site or any part thereof.

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

SHOP DRAWINGS - All drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by the Contractor, subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

SPECIAL PROVISIONS - A part of the Contract Documents, Additions and modifications to the Standard Specifications specifically prepared for the contract.

SPECIFICATIONS - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

SUBCONTRACTOR - An individual, firm or corporation having a direct contract with the Contractor or with any other subcontractor for the performance of a part of the Work at the site.

SUBSTANTIAL COMPLETION - That date as certified by the Engineer when the construction of the Work or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Work or specified part can be utilized for the purposes for which it is intended.

SUPPLEMENTAL GENERAL CONDITIONS - The part of the Contract Documents which amends or supplements these General Conditions.

SUPPLIER - Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

WORK – Labor or work necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the project.

WRITTEN NOTICE - Any communications to any party of the Agreement relative to any part of the Agreement prepared in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at its last given address, or delivered in person to said party or their authorized representative on the Work.

00700.2 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

As necessary to carry out the Work required by the Contract Documents, the Engineer may furnish additional instructions and detail drawings to the Contractor. The additional drawings and instructions thus supplied will become a part of the Contract Documents. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

00700.3 SCHEDULES, REPORTS, AND RECORDS

00700.3.1 SUBMITTALS

The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the Contract Documents for the Work to be performed.

00700.3.2 CONSTRUCTION PROGRESS SCHEDULE

At the Pre-Construction Conference, the Contractor shall submit a construction progress schedule showing the order in which it proposes to carry on the Work, including dates at which they will start the various parts of the Work, estimated date of completion of each part and, as applicable:

- The dates at which special detail drawings will be required; and
- Respective dates for submission of Shop Drawings, the beginning of manufacture, the testing and the installation of materials, supplies, and equipment.

00700.3.3 SCHEDULE OF PAYMENTS

The Contractor shall also submit a schedule of payments that it anticipates will be earned during the course of the Work.

00700.4 DRAWINGS AND SPECIFICATIONS

00700.4.1 INTENDED PURPOSE

The intended purpose of the Drawings and Specifications is to furnish the Contractor with sufficient information and direction so that he can furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and to complete the Work in an acceptable manner, ready for use, occupancy or operation by the Owner.

00700.4.2 GOVERNANCE

In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings.

00700.4.3 DISCREPANCIES

Any discrepancies found between the Drawings and Specifications and site conditions or any inconsistencies or ambiguities in the Drawings or Specifications shall be immediately reported to the Engineer, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after its discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk.

00700.5 SHOP DRAWINGS

00700.5.1 SUBMITTAL

The Contractor shall provide Shop Drawings as may be necessary for the execution of the Work as required by the Contract Documents. Portions of the Work requiring a Shop Drawing or sample submission shall not begin until the Shop Drawing or submission has been approved by the Engineer. When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that the Contractor has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents.

00700.5.2 REVIEW AND APPROVAL

The Engineer shall promptly review all Shop Drawings. The Engineer's approval of any Shop Drawings shall not release the Contractor from responsibility for deviations from the Contract Documents. The approval of any Shop Drawing which substantially deviates from the requirement of the Contract Documents shall be evidenced by a Change Order. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

00700.6 MATERIALS, SERVICES AND FACILITIES

00700.6.1 PURCHASING OF MATERIALS AND SUPPLIES

It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the Work within the specified time. Materials, supplies or equipment to be incorporated into the Work shall not be purchased by the Contractor or any subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller or any third party financing entity.

00700.6.2 STORAGE OF MATERIALS AND EQUIPMENT

Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection. The Contractor shall solely be responsible for making arrangements for suitable off-site storage of materials or equipment needed to accomplish the Work. Prior to using such area or facility, the Contractor shall obtain approval from the Engineer.

00700.6.3 FURNISHING AND INSTALLATION

Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

00700.7 INSPECTION AND TESTING

Inspection and testing of the Work shall meet the following requirements:

- All materials and equipment used in the construction of the Project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents.
- The Owner shall provide all inspection and testing services not required by the Contract Documents.
- The Contractor shall provide at its expense any testing and inspection services required by the Contract Documents.
- If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any work to specifically be inspected, tested, or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness. The Contractor will then furnish the Engineer the required certificates of inspection, testing, or approval.
- Inspections, tests or approvals by the Engineer or others shall not relieve the Contractor from its obligations to perform the Work in accordance with the requirements of the Contract Documents.
- The Engineer and the Engineer’s representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection, or testing thereof.
- If any work is backfilled or covered contrary to the written instructions of the Engineer it must, if requested by the Engineer, be uncovered for its observation and replaced at the Contractor's expense.
- If the Engineer considers it necessary or advisable that covered work be inspected or tested by others, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

00700.8 SUBSTITUTION OF MATERIALS

Whenever a material, article or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalogue number, it shall be understood that the reference is made for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function may be considered. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in

the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. Any cost reduction shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time.

00700.9 PATENTS

The Contractor shall pay all applicable royalties and license fees. They shall defend all suits or claims for infringement of any patent rights and hold the Owner harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, however if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, the Contractor shall be responsible for such loss unless the Contractor promptly gives such information to the Engineer.

00700.10 SURVEYS, PERMITS, AND REGULATIONS

00700.10.1 SURVEYS

The Owner shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the Work together with a suitable number of bench marks adjacent to the Work as shown in the Contract Documents. From the information provided by the Owner, unless otherwise specified in the Contract Documents, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pipe locations and other working points, lines elevations, and cut sheets from information provided by the Engineer.

00700.10.2 BENCHMARKS

The Contractor shall carefully preserve benchmarks, reference points and stakes. If willful or careless destruction to these stakes, marks or reference points results from the activities of the Contractor, the Contractor shall be charged with the resulting expense for their restoration and for any mistakes that may be caused by their loss or disturbance.

00700.10.3 TEMPORARY PERMITS AND LICENSES

Permits and licenses of a temporary nature necessary for the execution of the Work shall be secured and paid for by the Contractor, unless otherwise stated in the Supplemental General Conditions. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor observes that the Contract Documents are at variance therewith, it shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted as provided in Subsection 00700.13, Changes in the Work.

00700.11 PROTECTION OF WORK, PROPERTY, AND PERSONS

00700.11.1 SAFETY PRECAUTIONS

The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work and shall comply with all OSHA, State and local

requirements. This shall include taking all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to:

- All employees on the Work and other persons who may be affected thereby,
- All the work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and
- Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

The Contractor, solely, shall be responsible for the safety, efficiency, and adequacy of its equipment, materials and methods; and for any damage which may result from their failure or improper operation and maintenance.

00700.11.2 LEGAL COMPLIANCE

The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. The Contractor will notify owners of adjacent utilities when execution of the Work may affect them. The Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of the Owner or the Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

00700.11.3 EMERGENCIES

In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, shall act to prevent threatened damage, injury or loss. The Contractor will give the Engineer prompt written notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved.

00700.11.4 LIMITED USE OF WORKSITE

Unless otherwise allowed by these Contract Documents, the Contractor’s use of the Work site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities and field offices.

00700.12 SUPERVISION BY CONTRACTOR

00700.12.1 SUPERVISORY RESPONSIBILITIES

The Contractor will supervise and direct the Work and will be solely responsible for the means, methods, techniques, sequences, and procedures of construction. The Contractor will employ and maintain on the Work a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The supervisor shall have full authority to act on behalf of the Contractor and all communications given to the supervisor

shall be as binding as if given to the Contractor. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the Work.

00700.12.2 ACCESS TO ROADS, STREETS, UTILITIES, ETC.

The Contractor shall make its own investigation of the condition of available public roads and their clearances, restrictions and limitations which affect access to the Work and shall further be responsible for construction and maintenance of any haul road required for accomplishment of the Work. Nothing herein shall be construed to entitle the Contractor to exclusive use of any public street, alleyway, or parking area during the performance of the Work. The Contractor shall not close any public street or roadway without obtaining permission from both the Engineer and the appropriate jurisdictional authority.

The Contractor shall so conduct operations as to not interfere with the authorized work of utility companies or other entities so authorized within these areas. When excavation is performed along a public street or roadway, access to fire hydrants, appropriate erosion protection measures and passage of traffic in at least one lane shall be provided at all times by the Contractor.

00700.13 CHANGES IN THE WORK

00700.13.1 CHANGE IN SCOPE OF WORK

The Owner may at any time, as the need arises, order changes within the scope of the Work without invalidating the Agreement. If such changes increase or decrease the amount due under the Contract Documents, or affect the time required for performance of the Work, an equitable adjustment shall be authorized by Change Order.

00700.13.2 CHANGE ORDER

A Change Order will be issued to decrease or increase actual quantities used which are different than those shown in the Bid Schedule. All changes must be fully approved in writing on a Change Order before they can be included in a payment to the Contractor. The Contract Change Order form will be used to document and authorize changes to the Contract Documents unless approval to use another form is obtained from the Engineer.

00700.13.3 FIELD ORDER

The Engineer may, at any time, issue a Field Order to interpret construction plans or to document communications with the Contractor concerning details of the Work. The Contractor shall proceed with the performance of any changes in the Work so ordered by the Engineer.

If the Contractor believes that such Field Order entitles it to a change in Contract Price and/or time, it shall give the Engineer written notice thereof within seven (7) days after the receipt of the Field Order. The Contractor then shall document and submit the basis for the change in Contract Price or time within thirty (30) days.

If the Owner does not accept that a Change Order is appropriate as outlined in 13.1 and 13.2 above, written notice of this decision shall be provided to the Contractor within 30 days of the receipt of the Contractor's documentation of the change in the Contract price or time. Any dispute shall thereafter be resolved pursuant to the terms of these Contract Documents. Regardless of any dispute by and between the Contractor, Engineer and Owner, Contractor shall perform all work required by the Field Order, Change Order or other contract document contained herein.

00700.14 CHANGES AFFECTING CONTRACT PRICE

00700.14.1 CHANGE ORDER

The Contract Price may be changed only by a Change Order. The value of any work covered by a Change Order or of any claim for increase or decrease in the Contract Price shall be determined by one or more of the following methods in the order of precedence listed below:

- Unit prices previously approved in the Contract Documents.
- An agreed lump sum price.
- The actual cost for labor, direct overhead, materials, supplies, equipment, and other services necessary to complete the Work. In addition there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual cost of the Work to cover the cost of general overhead and profit.

00700.14.2 CHANGE IN QUANTITIES

The Owner reserves the right to change quantities listed in the Bid Schedule in order to revise the total Contract Price to match funding available in the Owner's budget.

00700.15 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

00700.15.1 TIME FOR COMPLETION

The date of beginning, and the time for completion, of the Work are essential conditions of the Contract Documents and the Work embraced shall be commenced on a date specified in the Notice to Proceed. The Contractor will proceed with the Work at such rate of progress as to ensure full completion within the Contract Time.

Both the Contractor and the Owner expressly understand and agree, separately and jointly, that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality at the time of the Work.

0700.15.2 LIQUIDATED DAMAGES

If the Contractor shall fail to complete the Work within the Contract Time, or within any extension of time granted by the Owner, then the Contractor will pay liquidated damages to the Owner in the amount specified in the Contract for each calendar day that the Contractor is in default as stipulated in the Contract Documents.

The Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is due to the following, and the Contractor has promptly given written notice of such delay to the Owner or Engineer:

- To any preference, priority or allocation order duly issued by the Owner, or
- To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; or
- To any delays of the subcontractor occasioned by any of the causes specified in the foregoing two paragraphs.

00700.16 CORRECTION OF WORK

The Contractor shall promptly remove from the premises all work rejected by the Engineer for failure to comply with the Contract Documents, whether incorporated in the construction or not. The Contractor shall promptly replace and re-execute that work in accordance with the Contract Documents and without expense to the Owner and shall bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement. If the Contractor does not take action to remove such rejected work within ten (10) days after receipt of written notice, the Owner may remove such work and store the materials at the expense of the Contractor. All removal and replacement work shall be done at the Contractor's expense.

00700.17 SUBSURFACE CONDITIONS

00700.17.1 DISCOVERY OF CONDITIONS

If, during the progress of the Work, previously known or unknown subsurface or latent physical conditions are encountered at the site which

- Differ materially from those indicated in the Contract Documents, or
- Differ materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, then

the party discovering such conditions shall promptly notify the other party both verbally and in writing of the specifically differing conditions before the site is further disturbed and before the affected work is performed.

00700.17.2 OWNER INVESTIGATION

The Owner shall promptly investigate the conditions, and if found that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the Work, an equitable adjustment shall be made and the Contract Documents shall be modified by a Change Order. Any claim of the Contractor for adjustment hereunder shall not be allowed unless the required written notice has been given; provided that the Owner may, if it determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

00700.18 SUSPENSION OF WORK AND TERMINATION OF CONTRACT

00700.18.1 SUSPENSION OF WORK BY OWNER

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 notice in writing to the Contractor and the Engineer. The notification will fix the date on which work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be allowed an adjustment in the Contract Price or an extension of the Contract Time, or both, directly attributable to any such suspension if Contractor makes a claim therefor as provided in Subsection 00700.30.

00700.18.2 TERMINATION OF CONTRACT FOR CAUSE BY OWNER

00700.18.2.1 GROUNDS FOR TERMINATION - The Owner may terminate the contract for cause as a result of the occurrence of any one or more of the following circumstances:

- Contractor's persistent failure to perform the Work in accordance with the Contract Documents including, but not limited to, failure to supply sufficiently skilled workers or suitable materials or equipment or failure to adhere to the progress and payment schedule established under Subsection 00700.3.3.
- Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
- Contractor's disregard of the authority of Engineer; or
- Contractor's violation in any substantial way of any provisions of the Contract Documents.

00700.18.2.2 ASSUMPTION OF WORKSITE BY OWNER - If one or more of the events described in the foregoing list occur, Owner may, after giving Contractor (and the surety, if any) seven days written notice, terminate the services of Contractor, exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment and machinery at the Site and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), 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 finish the Work as Owner may deem expedient.

00700.18.2.3 NO FURTHER PAYMENT TO CONTRACTOR - In such case, Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. The Engineer shall review such claims, costs, losses and damages incurred by Owner for reasonableness and, when approved by the Engineer, they shall be incorporated into the Contract as 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.

00700.18.2.4 FURTHER RECOURSE AGAINST CONTRACTOR - 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. Any retention or payment of monies due Contractor by Owner will not release Contractor from liability.

00700.18.3 TERMINATION OF CONTRACT FOR CONVENIENCE

The Owner, for his/her convenience, and without cause and without prejudice to any other right or remedy of Owner, may terminate the Contract by giving seven days written notice to Contractor and to Engineer. In such case, Contractor shall be paid (without duplication of any item) as follows:

- For 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;
- For 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;
- For 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) incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and
- For reasonable expenses directly attributable to termination.

The Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

00700.18.4 TERMINATION OF CONTRACT BY CONTRACTOR

If, through no act or fault of Contractor, the Work is suspended:

- For more than 90 consecutive days by Owner, or
- Because of an order of a court or other public authority, or
- The Engineer fails to act on any Application for Payment within 30 days after it is submitted, or
- Owner fails for 30 days to pay Contractor any sum finally determined to be due, then

Contractor may, upon seven days written notice to Owner and to 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 Subsection 00700.18.3.

00700.19 PAYMENTS TO THE CONTRACTOR

00700.19.1 APPLICATION FOR PAYMENT

00700.19.1.1 SUBMISSION OF APPLICATION - On or before the 10th day of each month, or as otherwise agreed, the Contractor will submit to the Engineer an Application for Payment for the work done in the previous month. The application shall be filled out and signed by the Contractor and be supported by such data as the Engineer may reasonably require.

The Application for Payment may include an allowance for the cost of major materials and equipment which have been delivered and suitably stored at or near the Work site but have not yet been incorporated into the Work. If payment is requested on this basis, the Application for Payment shall also be accompanied by such supporting data, satisfactory to the Owner, as will establish the Owner's title to the material and equipment and protect its interest therein, including proof of full coverage under applicable insurance. See Subsection 00700.21.4.5 below.

00700.19.1.2 ENGINEER'S APPROVAL - The Engineer will, within seven (7) days following receipt of each Application for Payment, review and either approve or reject the application. The Engineer will indicate approval in writing and present the request for payment to the Owner or trustee as applicable. If the application is rejected, the Engineer will return the application to the Contractor indicating in writing the reasons for rejecting it. In the latter case, the Contractor may make necessary corrections or revisions and resubmit the Application for Payment.

00700.19.1.3 PAYMENT BY OWNER - The Owner or trustee will, within thirty (30) days of presentation of an approved Application for Payment, pay the Contractor a progress payment on the basis of the Application. The Owner shall deduct, retain and administer the retainage amounts of each payment in accordance with provisions of applicable state and local laws. Unless otherwise specified in the Construction Contract Agreement or in the Special Provisions, amounts deducted, retained, administered and paid shall be as described below:

- As directed by the Engineer, the Owner shall deduct and retain up to ten (10) percent of the amount of each payment until there has been ninety-five (95) percent completion and acceptance of all work covered by the Contract Documents.
- When not less than ninety-five (95) percent of the Work has been completed, the Engineer may reduce the amount of retainage to one and one-half percent of the original Contract Price to ensure completion.
- Upon completion and acceptance of a part of the Work on which the price is stated separately in the Contract Documents, payment may be made in full, including retained percentages, less authorized deductions.

00700.19.2 NON-PAYMENT BY OWNER

Unless otherwise specified in the Agreement or elsewhere in the Contract Documents, if the Owner fails to make payment thirty (30) days after approval by the Engineer, in addition to other remedies available to the Contractor, there shall be added to each such payment interest at the current prime rate commencing on the first day after said payment is due and continuing until the payment is received by the Contractor.

00700.19.3 WITHOLDING OF PAYMENT BY OWNER

00700.19.3.1 DEFICIENCIES IN THE WORK - As a result of subsequently discovered evidence, the Owner may, after consultation with the Engineer, withhold or nullify the whole or part of any payment application as may be necessary to protect the Owner from loss for:

- Defective work not remedied
- Claims filed
- Failure of the Contractor to make payments properly to subcontractors or suppliers.
- Damage to another Contractor
- Performance of the Work in violation of the terms of the Contract Documents.

In the event this situation arises where the Work is substantially complete but lacks testing, cleanup and/or corrections, quantities may be reduced proportionately in the payment to cover such testing, cleanup and/or corrections.

When the deficiencies of the contract terms contributing to this action are corrected, payment will be made for amounts due in full.

00700.19.3.2 CONTINUED NON-PERFORMANCE - In the instance of continued non-performance or non-compliance on the part of the Contractor in making remedies or corrections to deficiencies in the Work, the Owner may himself, or with the help of another contractor or hired worker, perform the work necessary to bring about the required corrections and/or remedies. The cost of such work, to include both labor and materials, will be withheld from payments otherwise due to the Contractor until the situation has been resolved.

00700.19.3.3 REFERENCE - See also Subsection 00700.19.4 next below.

00700.19.4 PAYMENT INDEMNIFICATION

00700.19.4.1 SATISFACTION OF OBLIGATIONS - The Contractor will indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the Work.

The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so, the Owner may, after having notified the Contractor, pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of the Contract Documents, but in no event shall the provisions of this sentence be construed to impose upon the Owner any obligations to either the Contractor, the Contractor's surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Owner shall be considered as a payment made under the Contract Documents by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

00700.19.4.2 REFERENCE - See also Subsection 00700.24 below.

00700.19.5 FINAL PAYMENT ON COMPLETION OF WORK

Upon completion and acceptance of the Work, the Engineer shall issue a certificate, attached to the final Application for Payment, that the Work has been accepted under the conditions of the Contract Documents. The entire balance found to be due the Contractor, including the retained percentages, but except such sums as may be lawfully retained by the Owner, shall be paid to the Contractor within sixty (60) days (or per state law) of completion and acceptance of the Work.

00700.19.6 ACCESS TO PREMISES AND FACILITIES

00700.19.6.1 USE OF COMPLETED WORK – At any time, the Owner may, with the approval of the Engineer and with the concurrence of the Contractor, use any completed or substantially completed portions of the Work. Such use shall be authorized by issuance of a Notice of Substantial Completion and shall not constitute an acceptance of such portions of the Work.

00700.19.6.2 NON-CONTRACT WORK - The Owner shall have the right to enter the premises for the purpose of doing work not covered by the Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the re-storation of any damaged work except such as may be caused by agents or employees of the Owner.

00700.20 ACCEPTANCE OF FINAL PAYMENT AS RELEASE

The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor other than claims in stated amounts as may be specifically excepted by the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner and others relating to or arising out of this Work. Any payment, however, final or otherwise, shall not release the Contractor or its sureties from any obligations under the Contract Documents or the Performance Bond and Payment Bond.

00700.21 INSURANCE

00700.21.1 PURCHASE OF INSURANCE

The Contractor shall purchase insurance to protect against liability, loss, or other expense arising from damage to property or injury to or death of any person or persons incurred in anyway out of, in connection with, or resulting from the Work provided hereunder. The Contractor shall purchase the insurance from reliable insurance companies authorized to do business in the state in which the Work is to be performed. The insurance shall be rated "A" or better and have a financial size category of Class VII or larger as determined by A.M. Best Company at the time the Contract Documents are executed.

00700.21.2 CERTIFICATE OF INSURANCE.

Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. Such Certificates shall identify the Owner and Engineer (and any other party identified in the Supplemental General Conditions) as additional insured. These Certificates shall contain a provision that coverage afforded under the policies will not be materially changed or reduced unless at least thirty (30) days prior written notice has been given to the Owner.

00700.21.3 COVERAGE OF INSURANCE

Insurance purchased by the Contractor shall provide protection against claims including, but not limited to, those set forth below, which may arise out of, or result from, the Contractor's execution of the Work, whether such execution be by the Contractor or by any subcontractor or by any other person directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- Claims under workmen's compensation, disability benefit and other similar employee benefit acts;
- Claims for damages because of bodily injury, occupational sickness or disease, or death of its employees;
- Claims for damages because of bodily injury, sickness or disease or death of any person other than its employees;
- Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and
- Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

00700.21.4 REQUIRED INSURANCE

The required insurance shall be the following or equivalent, where each applies:

00700.21.4.1 WORKERS COMPENSATION - Workers Compensation Insurance and Employer's Liability Insurance that provide statutory benefits. The Best's rating requirements are waived for coverage provided by the Worker's Compensation Fund within the state in which the Project is located. The Contractor shall require all subcontractors at any tier to take and maintain similar policies of Workers' Compensation Insurance.

00700.21.4.2 COMPREHENSIVE - Comprehensive General Liability Insurance and/or Commercial General Liability Insurance, including coverage for premises and operations, explosion, collapse and underground hazards, contractual (including this contract, and personal injury including employees) with limits of not less than $1,000,000 combined single limit per occurrence, and not less than $2,000,000 aggregate which shall be designated as applying to this contract. If this insurance is made on a "claims made" basis, the certificate of insurance required above shall indicate, and the policy shall contain, an extended reporting period provision or similar "tail" provision such that claims reported up to one (1) year beyond the date of completion of this contract are covered.

00700.21.4.3 AUTOMOBILE - Comprehensive Automobile Liability insurance including owned, hired, and non-owned automobiles with limits not less than $1,000,000 combined single limit per accident.

00700.21.4.4 AIRCRAFT - The Contractor using its own aircraft, or employing aircraft in connection with the Work performed under these Contract Documents shall maintain Aircraft Liability Insurance with a combined single amount of not less than $1,000,000 per occurrence.

00700.21.4.5 PROPERTY - Unless otherwise provided, the Contractor shall purchase property insurance in an amount equal to the initial Contract Price plus any subsequent modifications thereto for the entire Work of the Project on a replacement cost basis with any applicable deductibles not to exceed $5,000.

Property insurance shall be on an all-risk form. It shall provide extended coverage and shall insure against the perils of fire and physical loss or damage including, without duplication of coverage, flood, earth movement, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings, and debris removal including demolition occasioned by enforcement of any applicable requirements. It shall include reasonable compensation for Engineer's services required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise called for in the Contract Documents.

Such property insurance shall be maintained, unless otherwise provided in the Contract Documents, or otherwise agreed to in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made or until no person or entity other than the Owner has an insurable interest in the Work to be covered. This insurance shall include interests of the Owner, the Contractor, and subcontractors in the Work. The form of this policy for this coverage shall be Completed Value. If the Owner is damaged by the failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable costs properly attributed thereto.

Unless otherwise provided in the Contract Documents, and with written approval of the Owner, this property insurance shall cover portions of the Work stored off the site, at the value established in the approval, as well as portions of the Work in transit.

00700.21.5 MAINTENANCE OF INSURANCE

Unless otherwise provided, all required insurance shall remain in force during the entire Contract Time.

00700.21.6 ARRANGEMENT OF POLICIES

Any policy required by this section may be arranged under a single policy for the full limit required, or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability Policy.

00700.21.7 ADDITIONAL INSURED

All liability insurance policies required hereunder shall provide that the Owner, Engineer and all departments, authorities and instrumentalities, and while acting within the scope of its duties, all of its elected or appointed officers, employees and authorized volunteers as well as advisory committees, shall be named as additional insured. Such policies shall also provide that coverage for the above insured is primary and not contributing.

00700.21.8 INSOLVENCY OF INSURER

Irrespective of the requirements as to insurance to be carried by the Contractor as provided herein; insolvency, bankruptcy or failure of any insurance company to pay all claims accruing, shall not be held to relieve the Contractor of any obligations hereunder.

00700.22 CONTRACT SECURITY

00700.22.1 PROVISION OF BONDS

The Contractor shall within ten (10) days after the receipt of the Notice of Award, furnish the Owner with a Performance Bond and a Payment Bond in penal sums equal to the amount of the Contract Price, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions, and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the execution of the Work provided by the Contract Documents. Such bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these bonds shall be borne by the Contractor.

00700.22.2 BANKRUPTCY OF SURETY

If at any time a surety on any such Bond is declared bankrupt or loses its right to do business in the state in which the Work is to be performed or is removed from the list of Surety Companies accepted on Federal bonds, Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such bond shall be paid by the Contractor. No further payments to the Contractor shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable Bond to the Owner.

00700.23 ASSIGNMENTS

Neither the Contractor nor the Owner shall sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of its right, title, or interest therein, or its obligations thereunder, without written consent of the other party.

00700.24 INDEMNIFICATION

00700.24.1 OWNER AND ENGINEER HELD HARMLESS

In addition to indemnification provisions of the Contract, the Contractor will indemnify and hold harmless the Owner and the Engineer and its agents and employees from and against all claims, damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, and subcontractor or supplier, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

00700.24.2 WORKMAN'S COMPENSATION AND EMPLOYEE BENEFITS

In any and all claims against the Owner or the Engineer, or any of their agents or employees, by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any

of them or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workmen's compensation acts, disability benefit acts or other employee benefits acts.

00700.24.3 ENGINEER LIABILITY

The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, its agents or employees arising out of the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications.

00700.25 SEPARATE CONTRACTS

00700.25.1 OTHER PROJECT CONTRACTS

The Owner reserves the right to let other contracts in connection with this Project. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly connect and coordinate the Work with theirs. If the proper execution or results of any part of the contractor's work depends upon the work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such work that render it unsuitable for such proper execution and results.

00700.25.2 ADDITIONAL PROJECT RELATED WORK

The Owner may perform additional work related to the Project, or the Owner, may let other contracts containing provisions similar to these. The Contractor will afford the other contractors who are parties to such contracts (or the Owner, if the Owner is performing the additional work), reasonable opportunity for the introduction and storage of materials and equipment and the execution of work, and shall properly connect and coordinate the contractor's work with theirs.

00700.25.3 WRITTEN NOTICE OF ADDITIONAL WORK

If the performance of additional work by other contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to the Contractor prior to starting any such additional work. If the Contractor believes that the performance of such additional work by the Owner or others involves the Contractor in additional expense or entitles it to an extension of the Contract Time, the Contractor may make a claim therefor as provided in Subsections 00700.14 and 00700.15 of these General Conditions.

00700.26 SUBCONTRACTING

The Contractor may utilize subcontractors under the following conditions:

- The Contractor may utilize the services of specialty subcontractors on those parts of the Work which, under normal contracting practices, are performed by specialty subcontractors.
- The Contractor shall not award work to subcontractor(s), in excess of fifty (50%) percent of the Contract Price, without prior written approval of the Owner.
- The Contractor shall be as fully responsible to the Owner for the acts and omissions of its subcontractors and suppliers, and of persons either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by itself.
- The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the Work of subcontractors and to give the Contractor the same power

as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

- Nothing contained in this Contract shall create any contractual relation between any subcontractor or supplier and the Owner.

00700.27 ENGINEER'S AUTHORITY

The Engineer shall act as the Owner's representative during the construction period and shall otherwise perform as follows:

- The Engineer shall decide questions which may arise as to quality and acceptability of materials furnished and work performed.
- The Engineer shall interpret the intent of the Contract Documents in a fair and unbiased manner.
- The Engineer will make visits to the site and determine if the Work is proceeding in accordance with the Contract Documents.
- The Engineer will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.
- The Engineer shall promptly make decisions relative to interpretation of the Contract Documents.
- The Engineer will carefully enforce the intent of the Contract Documents in regard to the quality of materials, workmanship and execution of the Work. Inspections may be made at the factory or fabrication plant of the source of material supply, when determined necessary by the Engineer.

00700.28 LAND AND RIGHTS-OF-WAY

00700.28.1 OWNER'S RESPONSIBILITY

Prior to issuance of Notice to Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the Work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed. The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

00700.28.2 CONTRACTOR'S RESPONSIBILITY

The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities or for storage of materials.

00700.29 GUARANTEE

The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date Final Acceptance. The Contractor warrants and guarantees for a period of one (1) year from the date of Final Acceptance of the Work that the completed Work is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the Work resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

00700.30 ARBITRATION

00700.30.1 DECISION BY ARBITRATION

All claims, disputes, and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by making an acceptance of final payment as provided by Subsection 00700.20 of these General Conditions, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered into any court having jurisdiction thereof.

00700.30.2 WRITTEN REQUEST FOR ARBITRATION

Notice of the request for arbitration shall be filed in writing with the other party to the Contract Documents and a copy shall be filed with the Engineer. Request for arbitration shall in no event be made on any claim, dispute, or other matter in question which would be barred by the applicable statute of limitations.

00700.30.3 CONTINUATION OF WORK

The Contractor will carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed to in writing.

00700.31 TAXES

The Contractor will pay all sales, consumer, use and other similar taxes required by the law of the place where the Work is performed.

OWNER FURNISHED EQUIPMENT AND START-UP REQUIREMENTS — SECTION 01000SP

01000.1 DESCRIPTION

A. A significant amount of key and critical treatment processing equipment has been selected and purchased by Mountain Green for the treatment plant. The pre-selected treatment equipment consists of:

Pre-treatment Equipment:

- Screen, Screening Conditioning Equipment, and Controls;

  Manufacturer: Huber Technology, Inc.
  Equipment: Multi-Rake Bar Screen: RakeMax-CF 4800x400x500/6
  Wash/Compactor Model: WAP 2
  Representative: Mike Charnholm, Goble Sampson Associates, Inc.
  Contact Info: Tel: (801) 268-8790
  Fax: (801) 268-8792
  3500 South Main Street, Suite 200
  Salt Lake City, UT 84115

- Grit Removal, Grit Trap, Washer, and Controls;

  Manufacturer: Huber Technology, Inc.
  Equipment: HUBER Lamella Grit Trap GritWolf® SS 2
  HUBER Coanda Grit Washer RoSF4 1
  Representative: Mike Charnholm, Goble Sampson Associates, Inc.
  Contact Info: Tel: (801) 268-8790
  Fax: (801) 268-8792
  3500 South Main Street, Suite 200
  Salt Lake City, UT 84115

Treatment Process Equipment:

- Biological Nutrient Removal Process and Equipment

  Manufacturer: Bioworks North America, Inc.
  Equipment: Fine Bubble Diffused Aeration
  Aeration chain butterfly valves
  Positive Displacement Blowers
  Dissolved Oxygen analyzer with transmitter and mounting
  Mixers (3) for the Bio-P zone
  PLC based control panel
  Representative: David Gibson – Bioworks North America, Inc.
  Contact Info: degibson@bioworksus.com
  P.O. Box 81
  Goshen, AR 72735
  912-445-5021

- Aerobic Digester

  Manufacturer: Environmental Dynamics International
  Equipment: EDI Aeration/Mixing Equipment, Positive Displacement Blowers, Diffusers, Piping and Supports within Digester Tank
  Representative: Corey Hughes – Westech Engineering, Inc.
  Contact Info: Tel: (801) 265-1000

Fax: (801) 265-1080
3625 South West Temple
Salt Lake City, UT 84115

- Clarifier Equipment and Controls

  Manufacturer: Westech Engineering, Inc.
  Equipment: Two (2) 70' Diameter COP Mechanisms with Dual Gate EDI, motors, and controls, Model COPC1
  Representative: Eric Whitmer – Westech Engineering, Inc.
  Contact Info: Tel: (801) 265-1000
  Fax: (801) 265-1080
  3625 South West Temple
  Salt Lake City, UT 84115

Solids Handling Equipment:

- Sludge Dewatering System, Conveyor System, and Controls.

  Manufacturer: FKC
  Equipment: Screw Press, Flocculation Tank, Polymer Injection System, Sludge Feed Pumps, Sludge Cake Pump, Pinch Valves, and Controls
  Representative: Mike Sorensen
  Waterford Systems
  2850 East 3300 South Ste. 201
  Salt Lake City, UT 84109
  Cell: 801-463-9900
  Email: mike.waterford@gmail.com

Disinfection Equipment:

- UV Disinfection System and Controls.

  Manufacturer: ENAQUA
  Equipment: MODEL: C5t.08062, Instrumentation and Controls
  Representative: Mike Sorensen
  Waterford Systems
  2850 East 3300 South Ste. 201
  Salt Lake City, UT 84109
  Cell: 801-463-9900
  Email: mike.waterford@gmail.com

B. The design of the treatment plant has been made around the selected and procured equipment. The CONTRACTOR will be required to build the treatment plant, including installation of the treatment equipment previously procured by the OWNER, plus furnishing and installing all other equipment and materials (not previously procured) which will be necessary to make a fully operational wastewater treatment facility. The detailed drawings include equipment schedules which show which materials will be supplied by OWNER and which materials will be supplied by Contractor. The Suppliers/Manufacturers are scheduled to be ready to deliver equipment 120 days after receiving Notice to Proceed. The anticipated equipment delivery date is November 4, 2008 at which time the CONTRACTOR will take possession and responsibility for the installation of said equipment.

C. The CONTRACTOR is responsible to insure coordination and compatibility of all equipment (OWNER furnished and CONTRACTOR furnished) in a complete working system. The Supplier and Manufacturers of the previously procured equipment are also required to cooperate and work with the CONTRACTOR in a fashion as if the equipment suppliers were the direct supplier to the CONTRACTOR for the equipment. The intent is to remove the OWNER as middle man between the CONTRACTOR and various manufacturers. The CONTRACTOR shall coordinate with equipment manufacturers both before and after the Bid and work in the conditions specified. The CONTRACTOR accepts the responsibility to look after, furnish and install, all materials and items supplied and not supplied by OWNER that are necessary for a fully operational wastewater treatment plant.

D. The equipment suppliers accept the responsibility to cooperate fully with the CONTRACTOR by providing necessary information and assistance, answer questions, provide complete material lists of equipment to be furnished, support the CONTRACTOR's efforts in identifying miscellaneous materials that are needed to be furnished by the CONTRACTOR in order to complete the Work, thereby transferring from the OWNER to the CONTRACTOR the loose ends that would ordinarily be the responsibility of the purchaser of the equipment.

E. The OWNER's responsibilities shall be as follows: Pay Supplier and/or Manufacturer according to the provisions in the contract between the OWNER and Supplier/Manufacturer, review shop drawings, arrange for and deliver necessary shop drawings to the CONTRACTOR, deliver product data and samples to the CONTRACTOR, deliver bill of materials to the CONTRACTOR, inspect deliveries jointly with the CONTRACTOR, assist Supplier/Manufacturer in operation testing, issue the Notice of Receipt and Notice of Final Acceptance.

F. The CONTRACTOR's responsibilities shall be as follows: coordinate and receive delivery, unload equipment, suitably store equipment on site, install equipment, start-up equipment, work with OWNER and Supplier/Manufacturer to test equipment, furnish and install all necessary items not furnished by Supplier/Manufactures, and other miscellaneous tasks necessary for the Supplier/Manufactures and CONTRACTOR to complete their contract responsibilities.

G. The Supplier/Manufacturers are under contract to provide installation supervision and start-up calibration, initial operation, performance test, and maintenance instruction to the OWNER, ENGINEER, and CONTRACTOR during installation and start-up operations. The amount of time that each Supplier/Manufacture is required to assist in installation and start-up operations is as follows:

Period	Number of Visits	Number of 8-hour man-days Required per visit
1. Screening & Screenings Conditioning		
Installation	1	1
Start-up and O&M Instruction	1	1
2. Grit Removal		
Installation	1	1
Start-up and O&M Instruction	1	1

3.	IFAS		
	Installation	2	1
	Start-up	1	1
	O&M Instruction	1	1
4.	Clarifier		
	Installation	2	1
	Start-up	1	1
	O&M Instruction	1	1
5.	Blowers, Diffusers, & Digester Piping		
	Installation	1	1
	Start-up and O&M Instruction	1	1
6.	UV Disinfection		
	Installation	1	3
	Start-up and O&M Instruction	1	3
7.	Sludge Dewatering		
	Installation	1	1
	Start-up and O&M Instruction	1	1

H. The CONTRACTOR shall coordinate its construction schedule with the actual delivery date of the equipment from the various manufactures or make arrangements for storage which will be in accordance with the Supplier/Manufacturers contract with the OWNER. The Suppliers/Manufacturers are scheduled to be ready to deliver equipment 120 days after receiving Notice to Proceed. The Notice to Proceed with the manufacturing of equipment will not be given until award to the CONTRACTOR has been made.

I. Upon request, the Suppliers/Manufacturers and the ENGINEER will make available to the CONTRACTOR all shop drawings and submittals. At the CONTRACTOR's request, additional information that is required for installation of the equipment will be provided. The Suppliers/Manufacturers shall furnish required O&M Manuals for the furnished equipment.

J. The CONTRACTOR shall receive delivery of the OWNER furnished equipment at the Wastewater Treatment Plant site, inspect the equipment against packing lists, unload equipment, and suitably store equipment per the manufacturer's instruction. Any damage to the equipment after delivery shall be repaired by the CONTRACTOR at the CONTRACTOR's expense. The equipment will arrive with final paint coating in place. The CONTRACTOR shall perform all touch-up painting, regardless of the cause, with the type of paint furnished by the supplier.

K. The CONTRACTOR shall provide in its bid all compensation to furnish and install all material not furnished by Suppliers/Manufacturers (as identified herein) in order to construct a complete operating treatment plant as specified and shown.

01000.2 START-UP REQUIREMENTS

A. The following outlines startup requirements of treatment plant equipment. The CONTRACTOR shall coordinate these procedures and tests with the Supplier/Manufacturer and OWNER.

B. Before the Treatment Plant is seeded with activated sludge wastewater, the system must be function tested using clean water to verify piping integrity and equipment operation. However, before performing a clean water test, all system components and tankage must be thoroughly cleaned and inspected. Inspection must yield results where all dust and debris has been fully removed from the treatment plant building and appurtenant equipment and tankage. Once treatment plant and equipment is thoroughly cleaned, tap water from the OWNER's culinary water system shall be used to fill the system to the normal operating levels.

C. Water to be used in the washing of the treatment plant and the clean water test shall be provided by the OWNER at no charge to the CONTRACTOR. However, the CONTRACTOR shall coordinate water demand needs with the OWNER to insure sufficient water is in place at all times for OWNER's use and fire protection.

D. After the treatment plant equipment and piping has been thoroughly cleaned, tested and calibrated, the treatment plant shall be seeded with activated sludge wastewater. The activated sludge seeding process shall be the responsibility of the OWNER and operation of the treatment plant shall commence at that time with the help and assistance of the Supplier/Manufacturer of the equipment and controls.

E. After the treatment plant and clean water test are complete and accepted by the ENGINEER and OWNER, a Notice of Substantial Completion will be issued to the CONTRACTOR in accordance with the Contract Documents and other requirements of the contract. The CONTRACTOR is required to warrant all construction work for a full one year period from the date of the Notice of Substantial Completion.

OWNER SELECTED EQUIPMENT (CONTRACTOR FURNISHED) AND START-UP REQUIREMENTS — SECTION 01010SP

01010.1 DESCRIPTION

A. A significant amount of key and critical treatment processing equipment has been selected and will be purchased by the Contractor for the treatment plant. The pre-selected treatment equipment consists of:

Treatment Process Equipment:

- Chemical Dosing Skids

Manufacturer(s): 1. Blue-White (Design Basis)

Equipment: Two Dual Pump Skid Systems (Model #:M3S24-QNGG)
Peristaltic Pump Accessories
Blue-White Dual Inlet/Outlet Pump Skid
Representative: Mike Sorenson
Contact Info: Waterford Systems, email: mike.waterford@gmail.com
2850 E 3300 S Ste. 201
Salt Lake City, UT, 84109
801-463-9900

Equipment shall include all programming and logic to connect to SCADA controls for a complete system. This shall include meters and valves necessary for automated operation and metering.

Solids Handling Equipment:

- Sludge Dewatering System, Conveyor System, and Controls.

Manufacturer(s): 1. FKC Company, Ltd. (Design Basis)
2. Engineer approved equal, must meet all requirements. Other manufacturers will require additional cost of design services for changes to plan set.

Equipment: 12-inch and 9-inch conveyor
Representative: Lucas Koelle, Technical Systems, inc.
Contact Info: Technical Systems, Inc.
2303 196th St SW
Lynnwood, WA 98036
(425) 775-5696

Design Criteria: 1,000 dry pounds per hour
120 cubic feet per hour
16-18% TS outlet

Design Basis included equipment:

(1) One FKC 12-inch, Inclined 21-feet Shaftless Screw Conveyor
(2) Two Omron ER6022 Emergency Stop Switches with pull cords
(1) One Siemens Milltronics Zero Speed Switch Probe
(1) Add 3HP Motor Starter and logic control to current panel
(1) One FKC 9-inch, Horizontal 19-feet Distributing Shaftless Screw Conveyor
(2) Two FKC Standard Slide Gates
(2) Two Omron ER6022 Emergency Stop Switches with pull cords

(1) One Siemens Milltronics Zero Speed Switch Probe
(1) Add 3HP Motor Starter and logic control to current panel submitted
(1) Add 120V power and logic control (for slide gates) to current panel

Equipment shall include all programming and logic to connect to SCADA controls for a complete system. This shall include meters and valves necessary for automated operation and metering.

B. The design of the treatment plant has been made around the selected equipment. The CONTRACTOR will be required to build the treatment plant, including installation of the treatment equipment previously selected by the OWNER, plus furnishing and installing all other equipment and materials (not previously procured) which will be necessary to make a fully operational wastewater treatment facility. The detailed drawings include equipment schedules which show which materials will be supplied by OWNER and which materials will be supplied by Contractor. The Suppliers/Manufacturers are scheduled to be ready to deliver equipment 120 days after receiving Notice to Proceed. The anticipated equipment delivery date shall determine at which time the CONTRACTOR will take possession and responsibility for the installation of said equipment.

C. The CONTRACTOR is responsible to insure coordination and compatibility of all equipment (OWNER furnished and CONTRACTOR furnished) in a complete working system. The Supplier and Manufacturers of the previously procured equipment are also required to cooperate and work with the CONTRACTOR in a fashion as if the equipment suppliers were the direct supplier to the CONTRACTOR for the equipment. The intent is to remove the OWNER as middle man between the CONTRACTOR and various manufacturers. The CONTRACTOR shall coordinate with equipment manufacturers both before and after the Bid and work in the conditions specified. The CONTRACTOR accepts the responsibility to look after, furnish and install, all materials and items supplied and not supplied by OWNER that are necessary for a fully operational wastewater treatment plant.

D. The equipment suppliers accept the responsibility to cooperate fully with the CONTRACTOR by providing necessary information and assistance, answer questions, provide complete material lists of equipment to be furnished, support the CONTRACTOR's efforts in identifying miscellaneous materials that are needed to be furnished by the CONTRACTOR in order to complete the Work, thereby transferring from the OWNER to the CONTRACTOR the loose ends that would ordinarily be the responsibility of the purchaser of the equipment.

E. The OWNER's responsibilities shall be as follows: Pay Supplier and/or Manufacturer according to the provisions in the contract between the OWNER and Supplier/Manufacturer, review shop drawings, arrange for and deliver necessary shop drawings to the CONTRACTOR, deliver product data and samples to the CONTRACTOR, deliver bill of materials to the CONTRACTOR, inspect deliveries jointly with the CONTRACTOR, assist Supplier/Manufacturer in operation testing, issue the Notice of Receipt and Notice of Final Acceptance.

F. The CONTRACTOR's responsibilities shall be as follows: coordinate and receive delivery, unload equipment, suitably store equipment on site, install equipment, start-up equipment, work with OWNER and Supplier/Manufacturer to test equipment, furnish and install all necessary items not furnished by Supplier/Manufactures, and other

miscellaneous tasks necessary for the Supplier/Manufactures and CONTRACTOR to complete their contract responsibilities.

G. The Supplier/Manufacturers are under contract to provide installation supervision and start-up calibration, initial operation, performance test, and maintenance instruction to the OWNER, ENGINEER, and CONTRACTOR during installation and start-up operations. The amount of time that each Supplier/Manufacture is required to assist in installation and start-up operations is outlined in the respective submittal.

H. The CONTRACTOR shall coordinate its construction schedule with the actual delivery date of the equipment from the various manufactures or make arrangements for storage which will be in accordance with the Supplier/Manufacturers contract with the OWNER. The Suppliers/Manufacturers are scheduled to be ready to deliver equipment 120 days after receiving Notice to Proceed. The Notice to Proceed with the manufacturing of equipment will not be given until award to the CONTRACTOR has been made.

I. Upon request, the Suppliers/Manufacturers and the ENGINEER will make available to the CONTRACTOR all shop drawings and submittals. At the CONTRACTOR's request, additional information that is required for installation of the equipment will be provided. The Suppliers/Manufacturers shall furnish required O&M Manuals for the furnished equipment.

J. The CONTRACTOR shall receive delivery of the OWNER furnished equipment at the Wastewater Treatment Plant site, inspect the equipment against packing lists, unload equipment, and suitably store equipment per the manufacturer's instruction. Any damage to the equipment after delivery shall be repaired by the CONTRACTOR at the CONTRACTOR's expense. The equipment will arrive with final paint coating in place. The CONTRACTOR shall perform all touch-up painting, regardless of the cause, with the type of paint furnished by the supplier.

K. The CONTRACTOR shall provide in its bid all compensation to furnish and install all material not furnished by Suppliers/Manufacturers (as identified herein) in order to construct a complete operating treatment plant as specified and shown.

01010.2 START-UP REQUIREMENTS

A. The following outlines startup requirements of treatment plant equipment. The CONTRACTOR shall coordinate these procedures and tests with the Supplier/Manufacturer and OWNER.

B. Before the Treatment Plant is seeded with activated sludge wastewater, the system must be function tested using clean water to verify piping integrity and equipment operation. However, before performing a clean water test, all system components and tankage must be thoroughly cleaned and inspected. Inspection must yield results where all dust and debris has been fully removed from the treatment plant building and appurtenant equipment and tankage. Once treatment plant and equipment is thoroughly cleaned, tap water from the OWNER's culinary water system shall be used to fill the system to the normal operating levels.

C. Water to be used in the washing of the treatment plant and the clean water test shall be provided by the OWNER at no charge to the CONTRACTOR. However, the CONTRACTOR shall coordinate water demand needs with the OWNER to insure sufficient water is in place at all times for OWNER's use and fire protection.

D. After the treatment plant equipment and piping has been thoroughly cleaned, tested and calibrated, the treatment plant shall be seeded with activated sludge wastewater. The activated sludge seeding process shall be the responsibility of the OWNER and operation of the treatment plant shall commence at that time with the help and assistance of the Supplier/Manufacturer of the equipment and controls.

E. After the treatment plant and clean water test are complete and accepted by the ENGINEER and OWNER, a Notice of Substantial Completion will be issued to the CONTRACTOR in accordance with the Contract Documents and other requirements of the contract. The CONTRACTOR is required to warrant all construction work for a full one year period from the date of the Notice of Substantial Completion.

01019.1 DESCRIPTION

This Section covers measurement and payment practices utilized by Sunrise Engineering in performing its contract management services according to the requirements of these Specifications and other parts of the Contract Documents.

01019.2 MEASUREMENT

01019.2.1 METHODS

The method of measurement and computations to be used in determination of quantities of material furnished, and of work performed under the Contract, will be those methods generally recognized as conforming to good engineering practice.

When items of improvement, equipment, or service referred to herein as "work" are shown on the plans and/or called for in the specifications for the Contractor to furnish, install, or provide, the items of work shall be measured and paid for in one of two ways. First, if the item of work is considered incidental to other items in the Bid Schedule, no separate measurement and payment shall be made and no separate bid item in the bid schedule will appear. In this case measurement and payment for this work shall be included by the Contractor in other bid items on the bid schedule. Second, when shown separately on the bid schedule, the item of work shall be measured as called for in the specifications and paid for at the contract unit price for that work.

01019.2.2 ACCURATE PRICING

The Bidder shall include a price for all bid items in the Bid Schedule and the Schedule of Values if required. Failure to do so may render the Bid non-responsive and may cause its rejection. All bids will be checked for errors. In the event the total "amount" indicated on the Bid schedule for a bid item does not equal the product of the unit price times the estimated quantity, the unit price shall govern, and the amount will be corrected accordingly. In the event the Bid Total does not agree with the sum of the prices bid on the individual bid items, the individual item prices shall govern and the total for the Bid schedule will be corrected accordingly. The Contractor shall be bound by any such corrections. For "Lump Sum" bid items, where applicable, the total shown on the Schedule of Values shall equal the amount entered for the corresponding bid item on the Bid schedule.

01019.2.3 U.S. STANDARD MEASURE

All work completed under this Contract will be measured by U.S. standard measure for the units described herein. Work performed by the Contractor will be measured in those units in accordance with the procedure described herein.

01019.2.4 MEASUREMENT BY ENGINEER

Since the quantities appearing on the Bid Schedules are approximate only and are prepared for the comparison of bids, all work and materials are subject to measurement by the Engineer. Measurement of work performed by the Contractor on Bid items with unit prices other than "lump sum" will be for the actual quantities of work performed and accepted, or material furnished in accordance with the Contract. In the case of lump sum bid items, the Engineer will verify that all of the work represented by the bid item has been completed.

01019.2.5 VARIATIONS IN QUANTITIES OF WORK

The scheduled quantities of work to be done and materials to be furnished may each be increased, decreased, or omitted at the Owner's discretion.

01019.2.6 MEASUREMENT BY LUMP SUM

The term "Lump Sum" when used as a unit of measurement for a structure or separate component of a structure shall include all work necessary to complete that entire structure or component, including all necessary fittings and accessories delineated by the pay limits as shown on the Drawings. If no pay limits are shown on the Drawings, then the structure or component shall include all fittings and accessories within 5-feet of the item.

01019.2.7 MEASUREMENT BY LINEAL FOOT

All work measured by the lineal foot shall be measured parallel to the centerline. For water and gas piping, no deduction will be made for valve, fittings or carrier pipe. For sewer collection piping, measurement shall be to the inside surface of connecting manholes. Piping connected to structures, except headwalls, shall be measured to a point five (5) feet outside of that structure, unless indicated otherwise on the Drawings.

A station, when used as a unit of measurement, will be 100 lineal feet.

Items measured by the lineal foot; such as pipe culverts, guardrail, under-drains, etc., will be measured parallel to the base or foundations upon which structures are placed.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fractions of inches.

01019.2.8 MEASUREMENT BY AREA

Area computations will be made from actual horizontal and transverse measurements made on the site of the work.

Structures will be measured to the neat lines shown on the plans or as altered to fit site conditions.

Lumber will be measured by the thousand feet board measure (M.F.B.M.) actually incorporated in the structure. Measurement will be based on nominal widths and thickness and the extreme length of each piece.

01019.2.9 MEASUREMENT BY VOLUME

In computing volumes of excavation, the average end area method will be used unless the Engineer and Contractor agree, in writing, to an alternate method.

Materials to be measured by volume or by load count shall be hauled in approved vehicles and measured at the point of delivery. Vehicles for this purpose may be of any size or type, provided the body is shaped so the actual volume may be readily and accurately determined.

When liquid bituminous materials are measured by the gallon or ton, volumes will be measured at 60° F, or will be corrected to the volume of 60 degrees F, using ASTM D 1250 for asphalt or ASTM D 633 for tars. When bituminous materials are shipped by truck or transport, net certified weights or volume subject to correction for loss or foaming, may be used for computing quantities.

01019.2.10 MEASUREMENT BY WEIGHT

The term "ton" will mean the short ton of 2,000 pounds avoirdupois.

When measurement units require weighing materials for payment, the Contractor shall be responsible for providing weight measurement from commercial certified scales or from scales provided at the job site which are certified in the state wherein the work is located.

Cement will be measured by the ton or hundredweight.

01019.2.11 CONVERSION OF WEIGHT TO VOLUME

When requested by the Contractor and approved by the Engineer in writing, materials specified to be measured by the cubic yard may first be weighed and the weight converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and agreed to by the Contractor before this method of measurement of quantities is used.

01019.2.12 SPECIFIC MANUFACTURED ITEMS

When standard manufactured items are specified; such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit, weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerance in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

01019.2.13 RENTAL EQUIPMENT

Rental of equipment will be measured in hours of actual working time and necessary traveling time of the equipment within the limits of the project. If equipment is ordered held on the project on a standby basis by the Engineer, the agreed rental rate, minus the labor and fuel costs, will be paid.

01019.2.14 MEASUREMENT BY EACH

All work measured by each shall be an an individual or single unit.

01019.3 PAYMENT

01019.3.1 SCOPE OF PAYMENT

The Contractor shall receive and accept compensation provided in the Contract as full payment for:

- Furnishing all materials, labor, equipment, tools, transportation and incidentals required for completion of work.
- All loss or damage due to the nature of the work, action of the elements and unforeseen difficulties until final acceptance by the Engineer, subject to the provisions of the General Conditions.
- All costs arising from any infringement of a patent, trademark or copyright.
- Bids shall include all sales tax and all other applicable fees.

01019.3.2 NON-PAYMENT

No payment will be made for:

- Work which is in excess of that described in the Contract Documents.

- Removal and replacement of defective work.
- Loss of anticipated profits.

01019.3.3 LUMP SUM

The term "lump sum", when used as a unit for payment, shall include all work required to complete the item, including all necessary fittings and accessories, as described in the Bid Schedule.

01019.3.4 FULL PAYMENT

The Contractor shall receive and accept compensation provided for in the Contract as full payment for furnishing all materials and for performing all work under the Contract in a complete and acceptable manner and for all risk, loss, damage or expense of whatever character arising out of the nature of the work or the execution thereof.

01019.3.5 VARIATION IN QUANTITY OF WORK

When the final and accepted quantity of an item of work varies from the original quantity in the Bid Schedule but is within twenty-five (25) percent of that quantity, whether more or less, the Contractor shall accept payment at the unit price shown on the Bid Schedule for the actual quantity of work performed, which shall constitute payment in full for that item. If the variation in the quantity of an item of work shown on the Bid Schedule exceeds twenty-five (25) percent of the original quantity, whether more or less, an adjustment of unit price will be negotiated. Any adjustment resulting from such negotiation shall be authorized by Change Order in accordance with the General Conditions.

The Owner reserves the right to make variations in quantities by adding to, or deleting from, quantities listed in the bid schedule in order to match the total bid with the money available in the budget.

01030.1 DESCRIPTION

This section covers project meetings including the pre-construction meeting and other progress and/or work coordination meetings conducted to provide communication and awareness to all parties associated with the Contract.

01030.2 PRE-CONSTRUCTION CONFERENCE

Prior to the commencement of work at the site, a pre-construction conference will be held at a mutually agreed time and place to be arranged by the Engineer. The Engineer shall also provide notification to all parties expected to attend the meeting. Attendees will include the following:

- Engineer
- Project Inspector
- Owner/Owner's Representative
- Contractor/Contractor's Representative/ Subcontractors as appropriate
- Governmental Representatives as appropriate (State, County, Municipal, etc.)
- Manufacturer/Supplier Representatives/Adjoining Contractors, as appropriate.
- Utility Service Representatives as appropriate.

01030.2.1 Unless previously submitted to the Engineer, the Contractor shall bring to the conference one copy each of the following:

- Contract construction schedule in accordance with the General Conditions.
- Procurement schedule of major equipment and materials and items requiring long lead-time.
- Shop Drawings, samples or substitution proposals for items proposed as substitutions or "or equal" items.
- Schedule of work that includes the anticipated monthly payment amounts during the contract.
- A Schedule of Values of work to be paid for as lump sum items where partial payment is anticipated.

01030.2.2 The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda may include but not be limited to the following items:

- Contractor's Work Schedule.
- Transmittal, review, distribution and approval of Contractor's submittals.
- Processing of applications for payment.
- Maintaining records and documents.
- Critical work sequencing.
- Field decisions and Change Orders.
- Use of project site, office and storage areas, security, housekeeping, and Owner's needs.
- Major equipment deliveries and priorities.
- Interpretation of Drawings and Specifications.
- Contractor's responsibilities for safety, first-aid and sanitation.

01030.2.3 The Engineer will preside at the pre-construction conference and will arrange for keeping minutes and distributing them to all attendees to the meeting.

01030.3 PROGRESS/COORDINATION MEETINGS

01030.3.1 The Contractor shall conduct regular on-site progress and coordination meetings at least weekly and at other times as requested by Engineer or as required by progress of the work. The Contractor, Engineer, and all Subcontractors active on the site shall be represented at each

meeting. The Contractor may, at its discretion, request attendance by representatives of its suppliers, manufacturers, and other Subcontractors. The Contractor shall be responsible for providing written notification to those deemed necessary for attendance at least 36 hours prior to the time set for the meeting.

01030.3.2 The Contractor shall preside at the meetings and maintain a file of minutes of the proceedings. The purpose of the meetings will be to review the progress of the work, maintain coordination of effort, discuss changes in scheduling, and resolve other problems which may develop.

01090.1 DESCRIPTION

Wherever in these Specifications references are made to the standards, specifications, or other published data of the various national, regional, or local organizations, such organizations may be referred to by their acronyms or abbreviations only. As a guide to the user of these Specifications, the following acronyms or abbreviations, which may appear herein, shall have the meanings indicated below.

01090.1.1 DEFINITIONS OF ABBREVIATIONS AND ACRONYMS

AAR	Association of American Railroads
AASHTO	American Association of the State Highway and Transportation Officials
ACI	American Concrete Institute
ADC	Air Diffusion Council
AGA	American Gas Association
AGC	Associated General Contractors
AGMA	American Gear Manufacturers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute, Inc.
APWA	American Public Works Association
ARI	Air Conditioning and Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
BLM	Bureau of Land Management (U.S. Department of Interior)
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturer's Association
CGA	Compressed Gas Association
CFR	Code of Federal Regulations
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturer's Institute
CMA	Concrete Masonry Association
CS	Commercial Standard of NBS (U.S. Dept. of Commerce)
CTI	Cooling Tower Institute
DIP	Ductile Iron Pipe
EIA	Electronic Industries Association
EPA	U. S. Environmental Protection Agency
ETL	Electrical Test Laboratories
FEMA	Federal Emergency Management Administration
FERC	Federal Energy Regulatory Commission
FS	Forest Service (U.S. Department of Agriculture)
FWS	Fish and Wildlife Service
GI	Galvanized Iron
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials

ID	Inside Diameter
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IMC	International Mechanical Code
IME	Institute of Makers of Explosives
IPC	International Plumbing Code
ISA	Instrument Society of America
ISO	International Organization for Standardization
MBMA	Metal Building Manufacturer's Association
NACE	National Association of Corrosion Engineers
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NFGC	National Fuel Gas Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NRCS	Natural Resources Conservation Service (U.S. Department of Agriculture) (formerly SCS)
NSF	National Sanitation Foundation
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PDI	Plumbing and Drainage Institute
PE	Polyethylene
PVC	Polyvinyl Chloride
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractor’s National Association
SSPWC	Standard Specification for Public Works Construction
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
UPRR	Union Pacific Railroad
USDARD	Rural Development (U.S. Department of Agriculture) (formerly Farmers Home Administration)
WCRSI	Western Concrete Reinforcing Steel Institute
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

01090.2 REFERENCED WORKS, CODES AND STANDARDS

Whenever references to specifications, codes, standards and other publications are made to these Specifications, the following rules shall apply:

01090.2.1 TITLES OF SECTIONS AND PARAGRAPHS

Titles of sections and/or paragraphs shown in these Specifications are for convenience of reference only, and do not form a part of the Specification.

01090.2.2 APPLICABLE PUBLICATIONS

Whenever references in these specifications are made to published specifications, codes, standards, or other requirements, it shall be understood that unless a date is specified, only the latest edition

of these specifications, codes, and/or standards which have been published as of the date that the work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No

requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

01090.2.3 SPECIALISTS AND SPECIAL ASSIGNMENTS

In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such direction shall be recognized as special requirements and is not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" and qualified for the assignment of the work. Nevertheless, the final responsibility for fulfilling this assignment remains with the Contractor.

01090.2.4 BUILDING CODES

Reference herein to "Building Code" shall mean the Uniform Building Code issued by the International Conference of Building Officials (ICBO). The latest edition of the code as approved and used by the local agency as of the date of award, as adopted by the agency having jurisdiction, shall apply to the work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

01090.2.5 OSHA

01090.2.5.1 OSHA REGULATIONS - References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

01090.2.5.2 OSHA STANDARDS - References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards of the U.S. Code of Federal Regulations, including all changes and amendments thereto.

01090.2.6 DOT STANDARDS/SPECIFICATIONS

References to "State DOT Specifications" or "State DOT Requirements" shall mean the Specifications for Excavation on State Highway Right-of-Way and/or Standard Specifications for Road and Bridge Construction, including all amendments thereto, issued by the State agency responsible for highways wherein the Contract is located and any other written requirements or provisions issued by that agency which are contained in these Contract Documents.

01090.2.7 FEDERAL PIPELINE SAFETY STANDARDS

Reference to "Federal Pipeline Safety Standards" shall mean Title 29, Parts 191 and 192, Federal Pipeline Safety Minimum Standards, U.S. Code of Federal Regulations including all changes and amendments thereto.

01090.2.8 STATE GAS PIPELINE SAFETY STANDARDS

References to "State Gas Pipeline Safety Standards" shall mean the appropriate section/s of the legal code or regulations adopted in the State wherein the work is located, including all changes and amendments thereto.

01090.3 STANDARDS IMPOSED BY OTHER AGENCIES OR ORGANIZATIONS

01090.3.1 PROPERTY BELONGING TO OTHER AGENCIES OR ORGANIZATIONS

Construction may occur on property owned or administered by agencies or organizations other than the Owner, such as federal and/or state departments of transportation, the U. S. Forest Service, the U. S. Bureau of Land Management, the U.S. Fish and Wildlife, counties, canal companies, irrigation companies, utility companies, other federal and state agencies, municipal governments, etc. Work which is to take place on such property may be required to be in accordance with special construction requirements of that agency or organization as well as these specifications.

01090.3.2 ADDITIONAL INFORMATION AND SPECIFICATIONS

Information will be provided on the plans to indicate areas of the Work which fall on property owned or administered by agencies and organizations other than the Owner. Specifications from agencies which are affected by the work will be provided in the Appendix to the Contract Documents. Those specifications provided in the Appendix shall be considered part of the Contract Documents and the Contractor shall include sufficient compensation in its bid to cover the work required for compliance thereto.

01090.4 CONFLICTS

In case of conflict between codes, reference standards, Drawings and the other Contract Document, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor required therefrom. The Contractor shall assume the most stringent requirements apply when preparing bids for this Contract.

01200.1 DESCRIPTION

The purpose of this section is to clarify certain aspects of the Project and the Contract that must be taken into consideration and completed before final acceptance of the Work can be given. These items include cleanup, demonstration of acceptable performance of equipment and facilities furnished and installed, submittals, payment for all work completed, issuance of final acceptance documentation, accepted repair and restoration of work and materials found defective during the warranty period. Specific instructions are provided herein for completion of the Work in such a manner that it will be fully acceptable and that the Contractor will be eligible for receipt of final payment.

01200.1.1 RELATED WORK AND REFERENCED SECTIONS

Not used.

01200.1.2 SUBMITTALS

Section 01300 - Submittals
See paragraph 01200.3.5 below.

01200.1.3 DEFINITIONS

Not used.

01200.2 MATERIALS

Not used.

01200.3 CONSTRUCTION REQUIREMENTS

01200.3.1 CLEANUP

The Owner will not give final acceptance of the Work until the Contractor has satisfactorily complied with the finishing and cleanup requirements contained in these Contract Documents and with any applicable local regulations. The Contractor shall accomplish the cleanup operations so as to leave the work site in an orderly, acceptable, and presentable condition.

01200.3.2 REPAIR AND RESTORATION

All major and minor damage to improvements and finished surfaces resulting from the Contractor's performance of the Work, whether to materials and equipment located on the project site or to those constructed under this Contract, shall be repaired to an original, or like-new, condition before final acceptance will be provided by the Engineer and Owner. Where damage to surfaces or materials can not be sufficiently repaired or restored, in the opinion of the Engineer, the Contractor may be required to replace the entire surface covering or structural member to achieve an original or like-new condition of the surface or material.

01200.3.3 TESTING

All performance and operational testing of facilities and equipment required by the Contract Documents, together with any required supportive documentation, shall be completed by the Contractor and approved by the Engineer prior to final acceptance of the Work.

01200.3.4 ACCEPTANCE FROM PROPERTY OWNER

The Contractor shall obtain a written release from each property owner on whose property work has been required by these Contract Documents. Such release shall indicate the property Owner's approval of the restoration and/or replacement of all disturbed improvements, surfaces and structures. Any request made to the Contractor by a private property owner, and determined to be unreasonable in the opinion of the Engineer, may be waived by the Owner.

01200.3.5 SUBMITTAL OF MANUFACTURER'S DOCUMENTATION

All guarantees and warranties, operation and maintenance manuals or brochures, or other materials furnished to the Contractor by the manufacturer for any equipment or material used for the Work shall be delivered to the Owner in protective 3-ring binders. Retainage held to the Contractor in accordance with the General Conditions of the Contract Documents will not be released until such documentation is submitted. See Section 01300 for more detail regarding O&M manuals.

01200.3.6 FINAL ACCEPTANCE

01200.3.6.1 CONTRACTOR'S STATEMENT OF COMPLETION - When the Contractor has completed the Work under this contract, including all of the Contractor's testing and clean-up, the Contractor shall inform the Engineer in writing that the Work has been completed and request a final inspection by the Engineer. The Engineer will then conduct a final inspection with the Owner and representatives of the pertinent funding and regulatory agencies. If items are found by the Engineer to be incomplete or not in compliance with the contract requirements, the Engineer will inform the Contractor of such items. After the Contractor has completed these items, the procedure shall then be the same as described above for the Contractor's statement of completion and request a final inspection.

01200.3.6.2 NOTICE OF FINAL ACCEPTANCE - After the Engineer has determined that all work required under the Contract Documents has been completed and that all of the considerations specified herein above are satisfactorily concluded, the Engineer will recommend to the Owner, in writing, that final acceptance of the entire Work under this contract be made as of the date of the Engineer's final inspection. The Owner and Engineer will then indicate formal approval and acceptance of the Work by issuing the "Notice of Final Acceptance" form.

01200.3.6.3 NO PARTIAL ACCEPTANCE - Unless otherwise required by Special Provisions, partial acceptance of any portion of the Work will not be made. While Substantial Completion notice can be issued in accordance with the General Conditions to allow use of completed work for its intended purpose, no acceptance other than the final acceptance of all completed work will be made. No inspection or approval or Notice of Substantial Completion pertaining to specific parts of the work shall be construed as final acceptance of any part until written final acceptance of all work is issued.

01200.4 METHOD OF MEASUREMENT

Not used.

01200.5 BASIS OF PAYMENT

Not used.

01300.1 DESCRIPTION

This section covers procedures to be followed by the Contractor when providing information to the Owner and/or Engineer to obtain approval of materials, equipment, procedures, etc. described in the Specifications and Drawings.

01300.2 SHOP DRAWINGS AND MATERIALS SUBMITTALS

01300.2.1 NUMBER OF COPIES OF SUBMITTALS

The Contractor shall furnish six (6) copies of each shop drawing and pertinent materials information sheet to the Engineer for review. A full set of submittals shall be provided to the Engineer seven (7) days prior to commencement of construction activity. Following review and approval, two copies shall be returned to the Contractor for his records, two shall be retained by the Engineer for inspection and verification purposes, and two shall go to the Owner as working and archival records.

01300.2.2 SHOP DRAWINGS

01300.2.2.1 CONTRACTOR REVIEW - The Contractor's shop drawing submittals shall be reviewed by a qualified representative of the Contractor, prior to submission to the Engineer. Such review shall be made to ensure the accuracy and compliance with the technical requirements and performance described and illustrated in the Drawings and Specifications.

01300.2.2.2 CONTENT - Shop drawings shall include drawings, pictures and sketches with sufficient details and explanations to reflect the Contractor's interpretations of components and required configurations not shown on the drawings, so that a documented record of such can be approved for incorporation in the Work. These drawings shall be accurate, distinct, and complete and shall contain all required information, including satisfactory identification of items and unit assemblies in relation to the Drawings and/or Specifications.

01300.2.2.3 TIMELY SUBMITTAL - Shop drawings shall be submitted sufficiently in advance to allow the Engineer not less than ten regular working days prior to manufacturing for examining the drawings.

01300.2.2.4 ENGINEER APPROVAL - When the shop drawings are approved by the Engineer, two sets of copies will be returned to the Contractor marked "Approved", "Revise as Noted", "Rejected", "Approved Except as Noted", or similar notification. If changes or corrections are necessary, one set will be returned to the Contractor with such changes or corrections indicated by a brief statement, and the Contractor shall correct and resubmit the drawings, in triplicate, to the Engineer.

Fabrication work shall not commence until the Engineer has reviewed the pertinent shop drawing/s and returned copies to the Contractor marked either "Approved" or "Approved - Except as Noted". Corrections indicated on such submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

Approval of shop drawings will not be required for reinforcing steel that is detailed by the Contractor in accordance with the Plans and Specifications. Any change from the Plans and Specifications made by the Contractor in any aspect of the Work shall be approved by the Engineer in a written Change Order prior to any work being altered from that already approved for construction.

001300.2.3 MATERIALS INFORMATION SUBMITTALS

In keeping with 01300.2.1 above, the Contractor shall assemble and submit six (6) original copies of each manufacturer's catalog cuts and materials information sheets pertaining to materials and equipment to be furnished and installed in the Work. These submittals shall be enclosed in 3-ring binders. Failure to submit all materials information may result in the Contractor's partial payments to be withheld until submittals are complete. Photocopies of the catalog cuts and information sheets will not be acceptable as submittals without prior authorization from Engineer.

01300.2.4 CONTRACTOR LIABILITY

The Contractor shall assume all responsibility and risk for any re-work or other costs resulting from errors in Contractor submittals. The Contractor shall be responsible for showing accurate dimensions and details of connections required to ensure the function of the equipment and/or component of the Work being illustrated.

01300.3 SAMPLES

01300.3.1 NUMBER OF SUBMITTALS

Whenever requested by the Engineer, the Contractor shall submit at least one sample of each item or material indicated in the Specifications to the Engineer for inspection and acceptance and do so at no additional cost to the owner.

01300.3.2 TIMELY AND ORDERLY SUBMITTAL

Samples shall be submitted sufficiently in advance of placement of orders that the Engineer shall have not less than ten regular working days for examining and testing the material for acceptance prior to delivery to the job site. Samples shall be submitted in an orderly sequence and appropriately identified so that dependent materials or equipment can be assembled and reviewed without causing delays in the work or mistakes in their identity.

01300.3.3 SELECTION OF COLORS AND TEXTURES

Unless otherwise specified, the Owner and the Engineer will select all colors and textures of specified items from the manufacturer's standard colors and standard materials, products, or equipment lines.

01300.4 OPERATIONS AND MAINTENANCE MANUALS

01300.4.1 STRUCTURE OF OPERATIONS AND MAINTENANCE MANUALS

The Contractor shall furnish to the owner four (4) identical sets of Operations and Maintenance manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring, loose-leaf, vinyl plastic, hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents shall be provided which indicates all equipment in the Operations and Maintenance manuals.

01300.4.2 CONTENTS

The Contractor shall include in the Operations and Maintenance Manuals the following information for each item of mechanical, electrical, and instrumentation equipment:

- Care and maintenance of all finished exposed surfaces.

- Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.
- Preventive maintenance procedures and schedules.
- Complete parts lists, by generic title, identification number, and catalog number, complete, with exploded views of each assembly.
- Disassembly and reassembly instructions.
- Name and location of nearest supplier and spare parts warehouse.
- Name and location of manufacturer.
- Recommended start-up, testing and troubleshooting procedures.
- Prints of the record drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these specifications.

01300.4.3 SCHEDULE OF DELIVERY

Operations and Maintenance manuals shall be submitted in final form to the owner before seventy-five (75) percent of the Work is completed. Any discrepancies found by the owner and Engineer in the Operations and Maintenance manuals shall be corrected by the Contractor prior to final acceptance of the project.

01300.5 SCHEDULE OF VALUES

At the time of the pre-construction conference, the Contractor shall submit a Schedule of Values of the Work measured as lump sum bid items. On the Schedule, those items shall be subdivided into component parts in sufficient detail as to form a basis for determining progress payments during construction. Quantities, and/or prices, shown on the Schedule shall equal the total contract price for each lump sum item. Information provided on the Schedule will be reviewed and approved by the Engineer when found acceptable. That information will then be incorporated into the data used for preparing the Application for Payment by the Engineer.

01300.6 CONTRACT CONSTRUCTION SCHEDULE

A construction schedule, prepared in accordance with requirements of the General Conditions, shall be submitted to the Engineer at the pre-construction conference. Unless required otherwise in Special Provisions, such schedule shall show the anticipated time of completion, approximate start dates of identifiable segments of the Work, and anticipated value of the work expected to be completed in monthly time periods within the contract period.

01300.7 PROCUREMENT SCHEDULE

At the time of the pre-construction meeting (see Section 01030), the Contractor shall submit a procurement schedule to the Engineer. This plan shall include all equipment and materials required for the Work included in the Contract that are not readily available and will require off-site manufacture and lead time which can affect the progress of the Work. The plan shall show at least the following information:

- Equipment/Material Name
- Anticipated amount of time for ordering, manufacturing, and shipping to Work site.

- Anticipated dates for ordering, receiving and installing.

01300.8 CONSTRUCTION PHOTOGRAPHY RECORDS

When required in the Contract Documents and prior to commencement of any of the Work, the Contractor shall prepare colored video photography records of all areas of the Contract work site and provide copies of such records to the Engineer. Such records shall become the property of the owner and may be used for determining the condition of work site/s and degree of restoration required for completion of the Work (see also Section 2000).

01400.1 DESCRIPTION

This section covers quality control of all work and activities on the part of the Owner, the Engineer, and the Contractor, to ensure compliance with these Specifications and the requirements of the Contract.

01400.2 ASSIGNMENT OF RESPONSIBILITY

01400.2.1 THE CONTRACTOR

The Contractor has primary responsibility for ensurance of quality control of the Work provided under the Contract. Therefore, any omission or failure on the part of the Engineer to notify the Contractor of, or to condemn defective work and/or materials at the time of construction shall not be taken as acceptance of the work or materials, and the Contractor will be required to correct any defective work or materials prior to final acceptance.

01400.2.2 THE OWNER AND ENGINEER

The Engineer will endeavor to locate any errors or defective materials or workmanship, and call them to the attention of the Contractor prior to subsequent work being performed. However, the Engineer is under no obligation to do so, and neither the Owner, nor the Engineer shall be held liable for errors, or defective material, or defective workmanship performed by the Contractor and not discovered by the Engineer prior to subsequent work being performed.

01400.2.3 CORRECTIONS

Prior to execution of the Agreement, the Engineer may correct errors and omissions to these Contract Documents by issuing Addenda. After execution of the Agreement, correction of errors, omissions or other changes necessitated shall be made in accordance with the General Conditions (Section 00700).

01400.3 QUALITY OF MATERIALS

01400.3.1 COMPLIANCE WITH SPECIFICATIONS

All materials and equipment incorporated in the Work shall be of new manufacture and shall be of the grade and quality described by these Specifications and the Special Provisions.

01400.3.2 SPECIFIED MATERIALS

Where a specific brand or manufacturer's equipment, model, system, or etc. is specified in these Specifications, no intention is made to be exclusive or limit competition, but rather to set forth the minimum standards for quality and performance.

01400.3.3 SUBSTITUTION OF MATERIALS

The Engineer, in accordance with the General Conditions (Section 00700.8), may allow substitution of equipment or materials. The Owner reserves the right to reject substitutions if, in his opinion, the proposed substitutions will not achieve comparable equipment installation and performance standards.

01400.4 QUALITY OF WORK

All workmanship incorporated in the Work covered by the Contract is to be of the grade and quality described by these Specifications and the Special Provisions.

01400.5 INSPECTION

01400.5.1 AUTHORITY AND DUTIES OF INSPECTOR

01400.5.1.1 AUTHORITY - Inspectors representing the Engineer are authorized to inspect all work performed and all materials furnished and to reject defective material and any work that is improperly performed, subject to the final decision of the Engineer. This authority extends to all or any part of the Work, including the preparation, fabrication, or manufacture of any materials or equipment to be used for completion of the Work. The Inspector is not authorized to alter or waive the provisions of these Specifications or other provisions of the Contract Documents. The Engineer may delegate additional authority to the Inspector when such action is determined to be necessary.

01400.5.1.2 DUTIES - Inspectors keep the Engineer informed as to the progress of the Work and the manner in which it is performed. Inspectors are also assigned to call the Contractor's attention to any observed nonconformance with the Contract Documents. The Inspector will not act as foreman for the Contractor.

01400.5.2 INSPECTION OF MATERIALS

01400.5.2.1 TESTING - In accordance with the Contract Documents and at the option of the Engineer, materials to be supplied under this contract will be tested and/or inspected either at their place of origin or at the site of the Work. The Contractor shall give the Engineer written notification well in advance of actual readiness of materials to be tested and/or inspected at the point of origin. Satisfactory tests and inspections at the point of origin shall not be construed as a final acceptance of the material nor shall it preclude re-testing or re-inspection at the site of the Work.

01400.5.2.2 SAMPLES - The Contractor shall furnish such samples of materials as are requested by the Engineer, without charge. No material shall be incorporated into the Work until the Engineer has approved it (see Section 01300).

01400.5.3 CONTRACTOR LIABILITY

The inspection of the Work shall not relieve the Contractor of any of its obligations to fulfill its contract as herein provided, and unsuitable materials may be rejected notwithstanding that such unsatisfactory performance may have been overlooked and accepted or estimated for payment.

CHARACTER OF WORKERS, METHODS AND EQUIPMENT — SECTION 01500

01500.1 DESCRIPTION

Covers requirements for aptness, competency, quality, and quantity in the labor, equipment, tools, and materials supplied by the Contractor for execution of the Work.

01500.2 REQUIREMENTS

In order to bring the Work to completion in the manner and on the time schedule required by the Contract Documents, the Contractor shall provide sufficient labor and equipment with adequate training and capability as follows:

- The Contractor shall employ sufficient labor and equipment with adequate training and capability for executing the Work to full completion in the manner and time required by these Specifications.

- All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have appropriate training and sufficient experience in such work, in the opinion of the Engineer, to perform all work properly and satisfactorily.

- Any person employed by the Contractor or by any Subcontractor who, in the opinion of the Engineer, does not perform their work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or Subcontractor employing such person. Such person(s) shall not be employed again in any portion of the Work without the approval of the Engineer. When such action is considered, and if requested by that employee, a hearing attended by the employee, Engineer, and Contractor shall be conducted before final dismissal action is taken.

- Should the Contractor fail to remove such person or persons as required above or fail to furnish suitable and sufficient personnel for the proper execution of the Work, the Engineer may suspend the Work by written notice until such order is complied with.

- All equipment, which is proposed to be used on the Work, shall be of sufficient size and in such mechanical condition, in the opinion of the Engineer, as to produce a satisfactory quality of Work. Equipment used on any portion of the Work shall be fitted with appropriate protective devices in accordance with OSHA and other applicable safety regulations such that no injury to employees, the Work, or to adjacent property will result from its use.

- When the specific methods and equipment to be used by the Contractor in accomplishing the Work are not described in the Contract Documents, the Contractor is free to use any methods or equipment that will accomplish the Work in conformity with the requirements of this Contract.

PROTECTION OF EXISTING IMPROVEMENTS — SECTION 01510

01510.1 DESCRIPTION

This section covers measures and instructions for prevention of damage to existing structures and utilities, whether above ground or underground, during execution of the Work of the Contract.

01510.2 PROTECTION OF EXISTING UTILITIES

01510.2.1 INTEGRITY OF UTILITIES

The Contractor shall be responsible for safeguarding and maintaining the integrity of all conflicting utilities. This responsibility includes securing the assistance of available utility location services in the area in which the Work is being performed. The Engineer has attempted to show the location of all utilities anticipated to conflict with the Work. However, when a conflicting utility line is discovered that was not shown on the plans, the Contractor shall contact the utility's owner and notify the Engineer immediately for resolution of the conflict. When realignment or relocation of the Work, or relocation of the conflicting utility is deemed necessary, the Engineer shall give direction in writing for the Contractor to proceed. Work resulting from such direction may be treated as a changed condition, and appropriate authorization and payment will be made in accordance with the General Conditions.

01510.2.2 LOCATING UTILITIES

It shall be the responsibility of the Contractor to locate and expose or identify all existing utilities, both underground and overhead, for the purpose of preventing damage to them. The Contractor shall notify all concerned utility offices at least 48 hours in advance of construction operations in which a utility agency's facilities may be involved. This shall include, but not be limited to, irrigation water, culinary water, telephone, gas, and electric.

01510.2.3 CHANGES TO UTILITIES

The Contractor shall be responsible for any and all changes to, or re-connections to, public utility facilities encountered or interrupted during execution of the Work, and all costs related thereto shall be borne by the Contractor. The Contractor shall negotiate with, and pay, the respective utility agency for work it must do in connection with moving, repairing, or restoring its utility(s). The Contractor shall further make all necessary notifications, scheduling, coordination, and management of details related to any such interference. The potential or projected cost of any public utility interference shall be included in the Contractor's price covering the major Contract Item to which the interference or changes are attributable.

01510.2.4 MAINTENANCE OF SERVICE

01510.2.4.1 CONTINUOUS SERVICE - Unless otherwise required in the Contract Documents, all utilities, both underground and overhead, shall be maintained in continuous service throughout the entire contract period. The Contractor shall be responsible and liable for any damages to or interruption of service caused by the construction.

01510.2.4.2 ACCIDENTAL INTERRUPTION OF SERVICE - In the event of interruption of other utility services as a result of accidental breakage, the Contractor shall promptly notify the appropriate responsible authority. The Contractor shall then cooperate with that authority in restoration of service as soon as possible, and shall bear all cost of repair. In no case shall interruption of any water or other utility service be allowed outside working hours unless the Engineer has issued prior authorization. When changeover of service connections to new utility lines becomes necessary, interruptions of individual services for periods of up to 8 hours will be allowed providing 24 hour advance notice has been given to affected users.

01510.2.4.3 TEMPORARY INTERRUPTION AND RELOCATION - If the Contractor desires to temporarily or permanently relocate or shut down any utility or appurtenance, the Contractor shall make the necessary arrangements and agreements with the owner or operator of the respective utility and shall be completely responsible for all costs concerned with the relocation or shutdown and reconstruction. Shutdown and relocation and/or reconstruction shall be subject to inspection and approval by the Engineer and the owner of the utility.

01510.3 PROTECTION OF PROPERTY AND EXISTING STRUCTURES

01510.3.1 REMOVAL OR RELOCATION OF PROPERTY - All property removed or relocated by the Work shall be reconstructed in its original or new location as soon as possible. Restoration of existing property or facilities shall be to a condition as good or better than its original condition.

01510.3.2 DAMAGE TO PROPERTY - All property damaged by the Contractor, whether inside or outside the limits of easements provided by the Owner, shall be the responsibility of the Contractor. All such damages shall be repaired with like material and restored to its original condition, or better. Such repair or restoration shall be accomplished at the Contractor's expense without additional compensation from the Owner.

01510.4 PROTECTION OF PAVED SURFACES

To avoid unnecessary damage to paved surfaces, tracked equipment shall use rubber cleats or paving pads when operating on or crossing all existing paved surfaces unless authorized otherwise in writing by the Engineer.

01510.5 RIGHTS-OF-WAY AND EASEMENTS

01510.5.1 MINIMAL DISTURBANCE OF RIGHTS-OF-WAY - When construction easements have been obtained by the Owner, the Contractor shall take appropriate measures to minimize disturbances to surface improvements within the easements. The Contractor shall obtain a signed release from each property owner, approving restoration work in the construction easements across its respective property/s.

01510.5.2 CONSTRUCTION AREAS - The Contractor shall confine construction operations to the area within the dedicated rights-of-way for public thoroughfares, or within areas for which construction easements have been obtained, unless the Contractor has made separate special agreements with the affected property owners in advance.

01510.5.3 PROPERTY OWNER NOTIFICATION - The Contractor shall give at least 48 hours advance notification of commencement of construction to property owners having land on which construction will take place. During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No one shall be cut off from access to their property for a period exceeding eight (8) hours unless the Contractor has made special arrangements with the affected persons. The Contractor shall grade all disturbed surfaces required for motor vehicle traffic at least daily unless directed otherwise in the Contract Documents or in writing by the Engineer.

01520.1 DESCRIPTION

This Section includes requirements that shall be followed by the Contractor, to protect the environment, while performing work under this contract. The Contractor shall also comply with any applicable additional requirements made by federal, state, or local government agencies.

01520.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 00700 – General Conditions, paragraph 32 (for RDA funded projects)

01520.1.2 SUBMITTALS

Section 01300 – Submittals.

01520.1.3 DEFINITIONS

Not used.

01520.2 MATERIALS

Not used.

01520.3 CONSTRUCTION REQUIREMENTS

01520.3.1 EXPLOSIVES AND BLASTING

The use of explosives on the work will not be permitted unless approved otherwise in the Contract Documents or in writing by the Engineer.

01520.3.2 DUST ABATEMENT

01520.3.2.1 CONTROL MEASURES - The Contractor shall furnish all labor, equipment, water and means required to provide effective dust control and abatement measures. Control measures shall be applied as often as necessary and wherever directed in writing by the Engineer, to prevent construction operations from producing dust in amounts that may be damaging to property, vegetation, or animals, or detrimental to persons within reasonable proximity of the work site.

01520.3.2.2 HAUL ROUTES AND WORK SITES - The Contractor shall identify haul routes or material handling areas, outside of the Work site, whereon dust may be generated, and shall exercise appropriate measures to abate any dust problem caused by its operation. Such dust abatement measures shall be taken immediately when observed or when required in writing by the Engineer.

01520.3.3 STORM AND GROUND WATER

01520.3.3.1 PERMITS REQUIRED - If a storm water NPDES permit is required, the Contractor is responsible to obtain such permit and comply with the conditions thereof.

01520.3.3.2 CONTROL MEASURES - The Contractor shall provide and maintain, at all times during construction, ample means and devices to promptly remove all water entering the Work, whether the water is surface or ground water. Water removed by the Contractor shall be directed into ponds or areas separated from live streams or drainage ways, to keep sediment from entering live water.

01520.3.3.3 DRAINAGE PATTERNS - In excavation, fill, and grading operations, the Contractor shall take care, to disturb the existing drainage pattern as little as possible. Particular care shall be taken not

to direct drainage water onto private property or into streets or drainage ways inadequate for the increased flow.

01520.3.3.4 FORDING OF WATERWAYS - Fording of live streams or any body of live water to accomplish the Work shall not be permitted. Mechanized equipment also shall not be operated in live water to accomplish the Work unless authorized in writing by the Engineer, or in the Contract Documents.

01520.3.3.5 FILLING OF WATERWAYS - The Engineer will not approve the filling of any ditches, washes, drainage ways, streams, wetlands, or other surface waters by the Contractor to accomplish the Work unless specific instructions are included in the Contract Documents which will provide for how the affected drainages or surface waters are to be treated.

01520.3.4 NOISE ABATEMENT

In or near inhabited areas, particularly residential areas, the Contractor's operations shall be performed in a manner to prevent noise from becoming a nuisance or problem. Particular consideration shall be given to noise generated by repair and service activities during the night hours.

01520.3.5 CHEMICALS

All chemicals and/or petroleum based products used during project construction or furnished for project shall be handled, applied and disposed of in strict accordance with the printed instructions of the manufacturer and regulations enforced by Federal, State and Local health authorities.

01520.3.6 WASTE AND SURPLUS MATERIALS DISPOSAL

01520.3.6.1 CLEAN WORK SITE - The Contractor shall keep the work site, haul roads and other areas of use in a neat, clean condition, free from any accumulation of surplus materials. It shall be the responsibility of the Contractor, at its own expense, to remove and legally dispose of all surplus materials resulting from all Work activities performed in accordance with the Contract Documents.

01520.3.6.2 SURPLUS MATERIAL - Surplus material includes, but is not limited to, salvaged materials and equipment that otherwise would have been abandoned in place, rocks too large to be used as backfill, wood and other organic or unsuitable materials, trash, rubbish, and waste products of any nature, and any other debris generated by the Work.

01520.3.6.3 REGULATORY COMPLIANCE - Disposal of surplus materials shall be accomplished in accordance with all local codes, laws, ordinances, and all applicable safety laws (particularly to the requirements of Part 1926 of the OSHA Safety and Health Standards for Construction) in affect at the approved disposal site. In no case shall it be acceptable for any surplus material to be disposed of in streams, marshes or wetlands.

01520.3.6.4 APPROVAL OF DISPOSAL - The Engineer will not approve any disposal operation, which creates an unsightly and/or unsanitary nuisance. The Contractor shall maintain disposal sites in a reasonable condition of appearance during construction. When designated and/or public disposal sites are unavailable, written approval must be obtained from the Engineer to dispose of any surplus materials on any other site. All disposal sites are subject to approval by the Engineer. The Contractor shall secure permission and all permits required for use of any dumpsite not previously arranged and designated by the Owner. The Contractor shall retain copies, and provide copies upon request, of all disposal permits and/or agreements obtained for the Contract Work.

01520.3.6.5 SCHEDULED REMOVAL - The Contractor shall establish regular intervals of collection and disposal of surplus materials during construction. Stockpiling of surplus materials for later disposal will not be approved or allowed.

01520.3.7 OPEN BURNING

Open burning of materials may be allowed only in strict accordance with all regulations in effect for the area at which the burning would be performed, and the Contractor shall obtain any necessary permits from the appropriate governing entity prior to the start of burning. The Contractor shall not allow fire to spread beyond the material intended for burning. No accumulation of residue from burning shall remain on or adjacent to the construction site, without written approval of the Engineer.

01520.3.8 SANITATION

01520.3.8.1 TOILETS - The Contractor shall provide fixed or portable chemical toilets for employee use in conformance with the requirements of Part 1926 of the OSHA Standards for Construction and when public toilets are not available or within fifteen (15) minutes walking distance of the Work site.

01520.3.8.2 COLLECTION OF WASTES - The Contractor shall be responsible for daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor shall be disposed of away from the site in accordance with all laws and regulations pertaining thereto.

01520.3.9 HAZARDOUS MATERIAL

01520.3.9.1 REGULATORY COMPLIANCE - Disposition of any hazardous material or toxic or hazardous waste shall be made in accordance with the requirements and regulations administered by the State agency wherein the Work site is located.

01520.3.9.2 ABNORMAL CONDITONS - Abnormal conditions include, but are not limited to, the following: buried barrels with liquid or solid contents; buried or above ground tanks with liquid contents; obnoxious odors; excessively hot earth; stained and discolored soils; smoke; unidentifiable powders, sludge, pellets; or any other similar condition.

01520.3.9.3 DISCOVERY AND NOTIFICATION - If any abnormal conditions are encountered during construction, which indicate the presence of a hazardous material, toxic, or hazardous waste, the Contractor shall immediately suspend work in the area of the discovery and notify the Engineer and treat the situation with extreme caution. The Contractor's operation in the area of discovery shall not resume until so directed by the Engineer; however, the Contractor shall continue working in other areas of the project, unless otherwise directed by the Engineer.

01520.3.9.4 DISPOSAL - When it becomes necessary for the Contractor to dispose of discovered materials, the work may be considered a change and administered in accordance with the General Conditions. Should the disposition of discovered waste material require special procedures or handling by certified personnel, the Contractor will make all such arrangements. When it becomes necessary to obtain permits for transporting or handling discovered material, the Owner will obtain the permits.

01520.3.9.5 SPILLS AND NOTIFICATION - In the event of spills of petroleum-based products or hazardous wastes by the Contractor, the Contractor shall immediately notify the Engineer. The Contractor shall also notify the appropriate State environmental enforcement agency, unless the spill consists of less than one (1) gallon of petroleum based products. In no case will notification be made later

than 24 hours after the discovery of the spill. In addition, written notification shall also be made within 5 calendar days of the discovery.

01520.3.9.6 COST OF CLEANUP - All costs for cleanup and disposal of hazardous materials due to spills, inappropriate handling, or negligence of the Contractor shall be borne by the Contractor.

01520.3.10 ENVIRONMENTAL COMPLIANCE

01520.3.10.1 REGULATORY COMPLIANCE - The Contractor shall comply with the applicable requirements of the National Historic Preservation Act as it relates to the preservation of ALL environmental resources. Clearance for protection of environmental resources located within the designated Work site is the responsibility of the Owner and such clearance has been obtained for the Contract, unless provided for otherwise in the Contract Documents.

01520.3.10.2 DISCOVERY OF HISTORIC/ARCHEOLOGICAL OBJECTS – The Contractor shall observe the following:

- DISCOVERY AND NOTIFICATION - If a suspected or unsuspected historic, archeological, or paleontological item, feature, or site is encountered, construction operations shall be immediately stopped in the vicinity of the discovery and the Engineer shall be notified of the nature and exact location of the findings. The Contractor shall not damage the discovered objects and shall provide written confirmation of the discovery to the Engineer within two (2) calendar days.

- RESTRICTION OF CONSTRUCTION - Should operations in the vicinity of a discovery be restricted, the Engineer will keep the Contractor informed concerning the status of the restriction. The Contractor should be aware that the time necessary for the Owner to negotiate the handling of the discovered is variable and is dependent on the nature and condition of the circumstances. It is possible that a delay of as much as three weeks in the vicinity of the discovery can be expected. The Engineer will inform the Contractor when the restriction is terminated. Changes required to accommodate delay or Work resulting from the discovery will be authorized in accordance with the General Conditions.

01520.3.11 OPERATIONS OUTSIDE OF THE PROJECT SITE

In the event the Contractor chooses to use any site or means of obtaining resources beyond those provided as part of the Contract, the Contractor shall retain the services of a qualified, certified environmental consultant to produce a research design or plan for obtaining any and all necessary environmental clearances for such use. The Contractor shall provide the plan to the Engineer for review and approval, as required, following which the plan shall be implemented. The Contractor shall submit evidence of environmental clearances and compliance before commencing any activities within the extended use area. At a minimum, clearances will include those listed below. Additional clearances may be required as necessary.

01520.3.11.1 CULTURAL RESOURCES (Archeological and Historic) - Clearance may require consultation with the State Historic Preservation Office.

01520.3.11.2 THREATENED AND ENDANGERED SPECIES - Compliance may require written clearance from the U.S. Fish and Wildlife Service.

01529.3.11.3 FLOOD PLAINS – May require consultation with the Federal Emergency Management Agency (FEMA) or corresponding state agency.

01520.3.11.4 WETLANDS AND OTHER BODIES OF WATER – May require consultation with the Army Corps of Engineers and/or appropriate state agency.

The Contractor is cautioned that obtaining environmental clearances can be costly and time consuming.

01520.4 METHOD OF MEASUREMENT

Not used.

01520.5 BASIS OF PAYMENT

Not used.

01560.1 DESCRIPTION

Construction staking procedures and responsibilities are broadly defined in the General Conditions and specific information is provided in this Section to define those procedures and responsibilities indicated in the General Conditions.

01560.2 QUALITY CONTROL

All construction staking, whether provided by the Contractor or the Owner, will be supervised by a land surveyor registered in the state in which the Work is located. Surveys will be performed consistent with professional practices and precision generally conducted by surveyors licensed in that state. Complete, legible survey notes will be maintained by the surveyors which show the locations and measurements required to establish construction staking. Such documents shall also provide information to identify the project, location of survey, date of survey, land surveyor's name and registration number. Copies of the Contractor's survey documentation shall be made available to the Owner upon request.

01560.3 OWNER RESPONSIBILITY

01560.3.1 FIELD LOCATION POINTS

Unless otherwise indicated in the Contract Documents, the Owner shall provide information on the Drawings and sufficient surveyed points in the field to locate all features and components of the Contract. Typically, field location points will be established to consist of the following:

01560.3.1.1 PRESSURE LINES - When pressure lines are located in established streets or areas with sufficient referencing features (curb, sidewalks, fence lines, etc.), no staking will be provided and location information shall be provided on the Drawings. When pressure lines are located in areas without sufficient referencing features, stakes will be set to establish the pipe centerline at 100-foot intervals. Where sloping of lines is critical (drain lines, etc.) cut stakes will be provided to indicate flow line elevation at beginning and ends of such lines.

01560.3.1.2 SEWER AND OPEN CHANNEL FLOW LINES AND MANHOLES - Manhole centerline locations will be shown with horizontal offset stakes and cut stakes to indicate the elevation of the flow line. In addition, cut stakes will be set to provide horizontal locations and grade 100-feet upstream on lines flowing into manholes.

01560.3.1.3 TANKS - Circular tank centerline location will be staked and a benchmark (grade) stake will be provided to establish floor top elevation. Exterior corners of rectangular tanks will be staked and a benchmark will be established for establishing floor top. Stakes locating rectangular tank corners will also be provided offset reference stakes.

01560.3.1.4 BUILDINGS AND OTHER STRUCTURES - Two reference points with offset reference stakes will be provided to establish horizontal location of one wall or the centerline. A benchmark (grade) stake will also be provided to establish vertical elevations of the building/structure/s components.

01560.3.1.5 ROADWAYS - In all roadway construction, offset stakes that identify location of the centerline of road will be set at intervals not to exceed 100-feet. When roadway construction requires specific grading, stakes will be set at the beginning points of cuts and fills with offset reference stakes. Hubs will be set to actual finished grades at the top edges of the subgrade and at each consecutive course of surfacing base. Hubs with offset reference stakes will be set on the centerline at the upstream and downstream lip of the flowline of all drainage pipes and structures. Staking intervals for roads with specified grading shall not exceed 100 feet in tangent sections and 50 feet in curved sections. When curbing and/or sidewalks are constructed along roadways, offset stakes with horizontal and vertical

referencing information will be set at intervals of not more than 50 feet. Bench marks for checking and establishing vertical elevations shall be set at intervals not more than 1000 feet apart.

01560.3.1.6 PONDS AND LAGOONS - Offset stakes which identify the centerline and cut/fill stakes with offset reference stakes will be set at intervals of not more than 100 feet as well as at the beginning and end of all curved sections of banks. At least one benchmark shall be provided for each cell of the pond for establishing and verifying vertical elevations.

01560.3.2 COST OF ERRORS

The Owner shall be responsible for the accuracy of any staking, measurements, grades and alignment set by its own surveys. The Owner shall cover costs resulting from staking errors attributable to the Owner's survey.

01560.4 CONTRACTOR RESPONSIBILITY

01560.4.1 ESTABLISHMENT OF GRADES, ETC.

The Contractor shall establish any grades, elevations and distances required for its construction operation from the control staking provided by the Owner and described above. The Contractor shall advise the Owner of anticipated conditions which will affect location of offset stakes and protect the control staking from its construction operation. Where control staking has been damaged or obliterated by the Contractor's operation, replacement of the staking shall be made in accordance with the provisions of the General Conditions.

01560.4.2 ERRORS IN CONSTRUCTION STAKING

When the Contractor observes discrepancies or errors in the control staking, such problems shall immediately be brought to the attention of the Engineer, and the Engineer shall take corrective action as necessary to resolve the problem.

01560.4.3 ACCURACY IN CONTRACTOR SURVEYING

The Contractor shall be responsible for the accuracy of any staking, measurements, grades, and alignments set by its own surveys. Any costs resulting from staking errors attributable to the Contractor shall be borne by the Contractor. The Engineer reserves the discretionary right to check the Contractor's staking, grades and measurements randomly at any time. When such checking is to be exercised, the Engineer will notify the Contractor of the location and the time at which the checking will commence. The Contractor shall then stop any respective part of the Work in progress until the Engineer has notified the Contractor that the checking has been completed and the Work has been found to be in accordance with requirements of the Contract Documents.

SPECIAL PROVISION

SWPP PLAN	SECTION 01571 SP

01571.01 PERMITS REQUIRED

A storm water NPDES permit is required for this project, the Contractor shall be responsible to obtain said permit and comply with the conditions thereof.

CONTRACTOR must implement construction site erosion controls sufficient to meet requirements of the EPA Storm Water Pollution Control requirements as authorized in the Clean Water Act. Contractor may select whichever best management practices will, in his/her opinion, best address these requirments. CONTRACTOR must formalize these measures into an Erosion Control Plan and submit such to the ENGINEER for review and approval. CONTRACTOR may not commence any site work, except mobilization, until the approved Erosion Control Plan has been installed and the ENGINEER concurs with its proper installation.

01580.1 DESCRIPTION

In general, the Contractor is responsible for providing and maintaining access to the Work, handling and storing of materials and equipment, safety and security within the Work site, and coordination and cooperation with the Owner, its representatives, governing authorities and other contractors working for the Owner in accordance with the provisions of the General Conditions. This section contains specific requirements which apply to these responsibilities.

01580.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 02005 – Traffic Control

01580.1.2 SUBMITTALS

Not used.

01580.1.3 DEFINITIONS

Not used.

01580.2 WORK SITE ACCESS

01580.2.1 INVESTIGATION OF WORK SITE AREA

The Contractor shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting ingress and egress to the site of the work.

01580.2.2 HAUL ROADS

It shall be the Contractor's responsibility to construct and maintain any new haul roads required for its construction operations.

01580.2.3 USE OF PUBLIC STREETS AND ALLEYWAYS

Nothing herein shall be construed to entitle the Contractor to the exclusive use of any public street, alleyway, or parking area during the performance of the Work, unless shown otherwise in the Contract Documents.

01580.2.4 CLOSURE OF PUBLIC ROADWAYS

No street, road, or highway shall be closed to the public without first obtaining permission from the proper governmental authorities and the Engineer. Where excavation is being performed in streets or highways, one lane in each direction shall be kept open to traffic at all times, unless otherwise authorized by the Contract Documents or the Engineer. Toe boards, or other measures, may be required by the Engineer to retain excavated material when deemed necessary.

01580.2.5 INTERFERENCE WITH UTILITIES

The Contractor shall so conduct operations as not to interfere unnecessarily with the infrastructure of utility companies or other agencies in such streets, alleyways, or parking areas.

01580.3 PUBLIC SAFETY AND ACCESS

Fire hydrants, approaches to fire stations, police stations and hospitals on or adjacent to the Work shall be kept accessible at all times. Appropriate measures shall be taken by the Contractor, to assure the use of sidewalks, and the proper functioning of all gutters, sewer inlets, water mains, drainage facilities and other infrastructure.

The Contractor's responsibility for Work safety or liability for Work site accidents is not lessened by the presence of the Engineer or his or another inspector performing monitoring of Work site safety conditions.

See also Section 02005 – Traffic Control.

01580.4 CONTRACTOR'S USE OF THE WORK SITE

The Contractor's use of the Work site shall be limited to its construction operations. Written approval by the Engineer will be required for any other use of the site, such as material and equipment storage, personnel vehicle parking, on-site fabrication facilities and field office.

01580.5 OFF-SITE STORAGE

The Contractor shall make arrangements for, bear any use costs associated with, and obtain written permission from the Engineer prior to using any off-site storage or shop areas or facilities determined necessary for execution of the Work. Storage facilities shall be equipped with fences and/or lockable entries that will prevent entry by unauthorized parties. Before off-site storage facilities are placed in use, the Contractor shall provided the Owner keys or combinations to locking devices used to secure the facility.

01580.6 COOPERATION WITH OTHER CONTRACTORS

Prior to authorizing other contractors to work on or adjacent to the Work site, the Owner shall notify the Contractor in writing and provide the name and address of the contractor, the name of its supervisor, a description of the work to be performed, and a schedule which shows the dates and planned segments of the work to be completed by the other contractor. In the event that conflicts or interferences occur between the Contractor and the other contractor's operation, the Engineer shall be notified immediately. The Engineer shall then take appropriate action needed to resolve the problem.

01700.1 DESCRIPTION

01700.1.1 SUMMARY

Section Includes

1. Project Record Drawings and Documents.
2. Final Project Record Drawings and Documents.
3. Operation and Maintenance Manuals.
4. Final Cleaning.
5. Adjusting.
6. Warranties.
7. Spare Parts and Maintenance Materials.
8. Closeout Procedures for Substantial Completion.
9. Closeout Procedures for Final Completion.
10. Building "Bake-Out" Procedure Prior to Occupancy

01700.1.2 PROJECT RECORD DRAWINGS AND DOCUMENTS:

A. The CONTRACTOR shall continually record factual information regarding all aspects of the Work, both concealed and visible; to enable future modification of design to proceed without lengthy and expensive site measurement, investigation and examination.

B. Monthly payments will not be released until record drawings have been updated to the satisfaction of the Project ENGINEER at each monthly meeting.

C. Maintain on site, one set of the following documents; record actual revisions to the Work (RECORD DRAWINGS) concurrent with construction:

1. Project Record Drawings (Bound Set): Record information on a set of Construction Documents using felt tip marking pens, maintaining a separate color for each major system. Do not conceal any work until required information is recorded. Legibly mark each item to record actual construction including, but not limited to:

    a. Measured depths of foundations in relation to finish main floor datum.
    b. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
    c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
    d. Field changes of dimension and detail.
    e. Details not on original Contract Drawings.

2. Project Record Documents (Project Manual; Bound in 3-Ring Binder): Legibly mark and record at each Product section description of actual Products installed, including the following:

    a. Manufacturer's name, contact, address and telephone number, and product model and number.
    b. Product substitutions or alternates utilized.
    c. Changes made by Addenda and Modifications.
    d. Addenda.

3. Project Record Documents (Shop Drawings and Submittals; Bound in 3-Ring Binder)shop drawings, product data, and samples: Shop drawings, product data

and samples are to be bound in a usable fashion in 3-Ring Binders arranged 4. Additional Project Information (Bound in 3-Ring Binder)

a. Change Orders and other Modifications to the Contract.
b. Field test records.
c. Inspection Certificates.
d. Manufacturers' Certificates.

D. Store Record Drawings and Documents separate from documents used for construction. Do not use Record Documents for construction purposes. Label documents as 'PROJECT RECORD DRAWINGS" or "DOCUMENTS".

E. Submit Project Record Drawings and Documents to Architect for review 10 days prior to Substantial Completion.

1. The Project ENGINEER will review Project Record Drawings and Documents prior to CONTRACTOR generating final reproducible record drawings. Upon request, CONTRACTOR shall participate in review meetings of Project Record Documents, make required changes, and then submit for final review by the Project ENGINEER.

2. Upon final review by the Project ENGINEER, the CONTRACTOR shall generate a set of reproducible Final Project Record Drawings and Documents as described below.

01700.1.3 FINAL PROJECT RECORD DRAWINGS AND DOCUMENTS

A. The CONTRACTOR is to provide the OWNER with one complete set of reproducible Final Project Record Drawings and Documents.

1. Final Project Record Drawings.

a. The Project ENGINEER shall provide the CONTRACTOR a set of original reproducible drawings.
b. The CONTRACTOR shall have this set reproduced with the Project ENGINEER's title block and seals deleted from all documents.
c. The CONTRACTOR shall transfer all information from the reviewed Project Record Drawings to this set.

2. Final Project Record Documents:(Reviewed Project Record Documents).

a. CONTRACTOR is to provide the OWNER with one (01) complete set of Final Project Record Documents Bound in 8-1/2 x 11 inch text page and Labeled according to Content as follows:
i. Project Manual (I rigid 3-ring binder).
ii. Shop Drawing, Product Data and Samples (1 rigid 3-ring binder).
iii. Additional Project Information (1 rigid 3-ring binder).
1) Change Orders and other Modifications to the Contract.
2) Field test records.
3) Inspection Certificates.
4) Warranties and Manufacturers' Certificates.

3. Final Project Record Drawings and Documents shall be submitted with the CONTRACTOR's Final Application for Payment. Payment Application shall not be reviewed without these Documents.

01700.1.4 OPERATION AND MAINTENANCE DATA

CONTRACTOR is to provide three (3) Sets of Operation and Maintenance Manuals 10 days prior to Substantial Completion, for review by the Project ENGINEER.

1. Manuals shall be bound in rigid 3-ring binders with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project printed on the cover. Internally subdivide the binder contents with permanent tabbed page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs. Prepare a Table of Contents for each volume, with each product or system description identified, type on 24 pound white paper.

2. Manuals are to include:

   a. Directory - List names addresses and telephone numbers of:
      i. Project ENGINEER
      ii. CONTRACTOR
      iii. Subcontractors
      iv. Major equipment suppliers.

   b. General Information - Provide copies of each of the following:
      i. Certificate of Occupancy
      ii. Lien Releases
      iii. Consent of Surety
      iv. Certificates of Insurance
      v. CONTRACTOR's and all Subcontractors One-Year Warranty.
      vi. Extended Warranties required in Individual Specification Sections.
      vii. Air and water balance reports.
      viii. Certificates.
      ix. Photocopies of warranties and bonds.
      x. Signed Receipt of Extra Stock Items (Form at end of this Section 01700).
      xi. Copy of Keying Schedule.
      xii. Signed Form that Operation and Maintenance Instruction has been completed with OWNER's Representative (Form at end of this Section 01700).
      xiii. Certified Completed Punch List.

   c. Operation and Maintenance Instructions Divisions 2-14 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
      i. Significant design criteria.
      ii. List of equipment.
      iii. Parts list for each component.
      iv. Operating instructions.
      v. Maintenance instructions for equipment and systems.
      vi. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

d. Operation and Maintenance Instructions Division 15 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
   i. Significant design criteria.
   ii. List of equipment.
   iii. Parts list for each component.
   iv. Operating instructions.
   v. Maintenance instructions for equipment and systems.
   vi. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

e. Operation and Maintenance Instructions Division 16 - Arranged by specification section and for each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Including, but not limited to, the following:
   i. Significant design criteria.
   ii. List of equipment.
   iii. Parts list for each component.
   iv. Operating instructions.
   v. Maintenance instructions for equipment and systems.

f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

3. Submit one copy of completed volumes in final form 10 days prior to Substantial Completion. This copy will be returned with Project ENGINEER comments. Revise content of documents as required prior to Final Completion.

4. Final O & M Manuals shall be presented to Project ENGINEER at Final Completion.

01700.1.5 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion and, if necessary, provide additional cleaning in areas of Work prior to Final Completion.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep and wash paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

01700.1.6 BUILDING “BAKE-OUT” PRIOR TO OWNER OCCUPANCY

In order to accelerate off-gassing of Volatile Organic Compounds from building finishes and furnishings prior to OWNER Occupancy, the CONTRACTOR shall:

1. Maintain indoor air temperature at 90° degrees F (32 degrees C), with 100% outside air,

for a period of 48 continuous hours.

2. Provide additional heat sources as required to maintain the temperature at the specified level for the stipulated time period.

3. Coordinate with the OWNER so that 100% outside air is provided for a period of 30 days after OWNER Occupancy.

01700.1.7 ADJUSTING

Adjust operating products and equipment to ensure smooth and unhindered operation.

01700.1.8 EXTENDED WARRANTY

A. CONTRACTOR shall secure guarantees and/or warranties required for each section of the work, properly addressed and signed and in favor of OWNER. Execute and assemble documents from Subcontractors, suppliers, and manufacturers as identified under Final Project Record Documents above.

B. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

01700.1.9 SPARE PARTS, MAINTENANCE MATERIALS, & EXTRA STOCK ITEMS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Handling and storage requirements outlined in Section 01580 - Material and Equipment shall be met.

C. Maintain spare products in original containers with labels intact and legible until delivery to OWNER.

D. Coordinate delivery with OWNER. Deliver and unload spare products to the designated location prior to Substantial Completion.

E. Obtain written verification of quantities and acceptance of spare parts and maintenance materials from authorized OWNER's representative. (Form provided following this Section).

01700.1.10 CLOSEOUT PROCEDURES FOR SUBSTANTIAL COMPLETION

A. Provide the following items:

1. Submit Project Record Drawings and Documents ten days prior to CONTRACTOR's Request for Substantial Completion.

2. 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 Architect's review.

3. Submit a list of Project Deficiencies to the Project ENGINEER 48 hours minimum prior to Substantial Completion Review.

4. Provide two (2) copies of submittals to Project ENGINEER that are required by governing or other authorities.

5. OWNER will occupy all of the building as specified in Section 01010 upon Substantial Completion.

B. Should status of completion of work require additional review by Architect due to failure of work to comply with CONTRACTOR's claim of Substantial Completion, OWNER will deduct the amount of compensation for additional review services from final payment to CONTRACTOR.

01700.1.11 CLOSEOUT PROCEDURES FOR FINAL COMPLETION

A. Submit Final Record Drawings and Documents.

B. Submit Final Operations and Maintenance Manuals.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Should status of final completion of work require additional review by Project ENGINEER due to failure of work to comply with CONTRACTOR's claim of Final Completion, OWNER will deduct the amount of compensation for additional review services from final payment to CONTRACTOR.

02000.1 DESCRIPTION

This section describes preparatory work and materials necessary for obtaining clearances for the Work; moving personnel, equipment, supplies and incidentals to the Project Site; quality control; clean-up; temporary utilities and quarters; permits, bonds and insurance; dust abatement, storm water control, and noise abatement; waste and rubbish disposal and control; sanitation; and project close-out operations.

02000.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 01200 - Contract Closeout
Section 01510 - Protection of Existing Property
Section 01520 - Environmental Controls
Section 02005 - Traffic Control

02000.1.2 SUBMITTALS

02000.1.2.1 VISUAL RECORDS - The Contractor shall furnish at least one copy of all visual records, as described below in 02000.3.2, to the Owner. If the Owner has more exacting requirements for visual records, those requirements shall be detailed in the Special Provisions to these Specifications.

02000.1.2.2 SERVICE CONNECTION LOCATION AND DOCUMENTATION - The Contractor shall deliver all signed tie-sheets (see 02000.3.3 below) to the Engineer not less than forty-eight hours prior to when the service connection is to be installed.

02000.1.3 DEFINITIONS

Sign - A complete assembly including panel and posts, with fasteners, installed at designated locations.

Video Record - Photography on videocassette tapes of areas potentially liable for disturbance as a result of the Work required by this Contract.

Service Connection Interview & Documentation - Interviews with potential system users and the documentation of location data for service connections to the respective property from utility lines being installed under this Contract.

Tie Sheets - Forms provided by the Engineer for use in documenting the location of service connection/s of system users.

Service Connection - Piping extending from the main utility line to the property line, or designated connecting point, of any user of the system.

02000.2 MATERIALS

02000.2.1 SIGN PANELS

5/8-inch thick (A or B) exterior grade plywood sheets with best quality exterior enamel paint for face painting and lettering, fastened to posts with at least four 1/2-inch galvanized bolts.

02000.2.2 POSTS

4x4 Cedar or treated Pine commercial fence posts at least eight-feet long or as shown on the Drawings.

02000.2.3 VISUAL RECORD

Records shall be made on professional quality, standard VHS format videotape. Tapes shall be provided with protective covers and shall be labeled to indicate the area covered by the photography.

02000.3 CONSTRUCTION REQUIREMENTS

02000.3.1 PROJECT SIGN

The Contractor shall provide project signs, which includes furnishing all materials and labor to fabricate, deliver, install and maintain any and all project identification signs as detailed on Drawings and at location(s) shown thereon.

02000.3.2 VISUAL RECORDS

Prior to any disturbance of the area, the Contractor shall produce a video photography of all areas, including but not limited to right-of-ways, streets and roadways, haul-roads and access routes, storage areas, construction sites, and buildings or structures, which will be, or may be, affected by the Work. Such photography will be of a quality to allow accurate determination of location, size, and condition of existing features and improvements taken prior to any occupancy or execution of Work by the Contractor.

02000.3.3 SERVICE CONNECTION LOCATION AND DOCUMENTATION

Unless called for differently, the Contractor shall contact and interview the owners of all properties indicated on the Drawings and obtain from them sufficient information for location of workable service connections for each property. The Contractor shall document those locations on the tie sheets and obtain a confirmation signature from the connection owner.

02000.4 METHOD OF MEASUREMENT

02000.4.1 MOBILIZATION

Mobilization shall be measured by the lump sum.

02000.4.2 PROJECT SIGN

Measurement for project signs shall be made by counting each sign installed and accepted.

02000.4.3 VISUAL RECORDS

Pre-Construction Photography shall be measured by the lump sum.

02000.4.4 SERVICE CONNECTION DOCUMENTATION

Service Connection Documentation shall be measured by the lump sum.

02000.5 BASIS OF PAYMENT

02000.5.1 The accepted quantity(s) shall be paid for at the contract unit price for:

PAYMENT ITEM	UNIT
Mobilization	Lump Sum
Project Sign	Each
Pre-Construction Video	Lump Sum
Service Connection Documentation	Lump Sum

02000.5.2 PAYMENT SCHEDULE

The amount bid or identified in a schedule of values for Mobilization shall not exceed 10% of the total contract bid amount. The following payment schedule percentages shall be based on amount bid or identified in a schedule of values for Mobilization up to a maximum of 10% of the total contract bid. Any portion of the mobilization bid amount which exceeds 10% of the total contract bid amount, will be paid to the Contractor after final acceptance of the Work, with the last mobilization payment. (See "overage amount" in the payment schedule table below).

Partial payments for Mobilization will be made in accordance with the payment schedule table below.

MOBILIZATION PAYMENT SCHEDULE

Payment	Amount	When Paid
1ST	25% of mobilization	With first partial payment after 3% of the original contract amount earned by the Contractor.
2ND	25% of mobilization	When amount earned by Contractor is 10% of the original contract price.
3RD	25% of mobilization	When amount earned by Contractor is 50% of the original contract price.
4TH (last)	25% of mobilization + "overage amount"	When project is complete and accepted.

02005.1 DESCRIPTION

This section covers furnishing and maintaining all traffic control devices, flaggers and pilot vehicles necessary for protection of the Work, the workers and the traveling public in accordance with these Contract Documents. The requirements of this section are not intended to supersede, but shall supplement, the provisions contained in the "Manual of Uniform Traffic Control Devices" issued by the U.S. Department of Transportation, and any other applicable state or local traffic control regulations.

02005.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 01580 – Work Site Management
Section 02206 – Access Roads and Temporary Use of Roads

02005.1.2 SUBMITTALS

The Contractor, upon request of the Owner or Engineer, shall submit detailed traffic control plans for specific areas of the Work.

02005.1.3 DEFINITIONS

Traffic Control Devices - All temporary traffic control and warning devices required to warn traffic of, and to guide it through, construction areas as required under this Contract, including, but not limited to: portable cones and barricades, signs, channeling devices, paint striping, lighting devices, flags, etc.

Flaggers - Qualified and alert persons equipped with safety warning devices who direct traffic through construction areas.

Traffic Lane - Ten (10) feet of clear street width with a safe motor vehicle speed of twenty-five (25) miles per hour.

Pilot Car - Any designated and properly marked vehicle used for leading groups of vehicular traffic through construction areas.

02005.2 MATERIALS

Not Used.

02005.3 CONSTRUCTION REQUIREMENTS

02005.3.1 COORDINATION OF WORK AND TRAFFIC CONTROL

The Contractor shall endeavor to organize its work force in such a manner as to minimize the closure of public streets and roadways within the Work site. If conditions justify, the Engineer may direct the Contractor to conduct Work in specific areas and/or to specific tasks to avoid closure or interference with traffic on public streets and roadways.

02005.3.2 CLOSURE OF PUBLIC THOROUGHFARES

The Contractor shall not close any public street or roadway without prior approval by the Engineer. When closure is necessary, and approved, the street or roadway shall only be closed to through traffic and not to local traffic. Closure may extend for one city block only, or 700 feet,

whichever is less. Closure of streets and roadways shall be made with barricades meeting State DOT standards. Traffic shall be kept open on streets and roadways where no detour is possible.

02005.3.3 MAINTENANCE OF EXISTING SIGNS

Existing traffic signs other than stop, yield, and street name signs shall be maintained by the Contractor until such time as construction renders them obsolete. At that time the Contractor shall remove signs and posts without damage and deliver them as directed by the Engineer.

02005.3.4 PROTECTION OF WORK AND TRAFFIC

All obstructions and excavations, within traveled streets and roadways, shall be protected with traffic control devices meeting State DOT standards. Traffic control devices, placed within streets and roadways, shall be illuminated at night, and such illumination shall function from sunset to sunrise. Local jurisdiction may require traffic control measures greater than those of State DOT standards, in which case the Contractor shall comply with such requirements.

Whenever the Engineer finds traffic control conditions at the Work site to be inadequate to assure public safety, or the Contractor's protective facilities to be inadequate, the Engineer may require the Contractor to provide the additional necessary facilities or services. The Contractor shall bear the cost of the additional protection.

See also Subsection 01580.3.

02005.4 METHOD OF MEASUREMENT

02005.4.1 TRAFFIC CONTROL AS LUMP SUM

If traffic control appears as a separate item in the Bid Schedule, it shall be measured as a lump sum item. Therefore, with the possible exception of the items mentioned in the following two paragraphs, no separate measurement will be made for furnishing and maintaining traffic control devices, personnel, or any vehicles or other equipment used for traffic control.

02005.4.2 FLAGGING

When flagging is listed separately in the Bid Schedule, the work of flag persons will be measured by counting the number of hours put in by each separate flag person. This measurement shall include the time and/or mileage for any vehicle or other equipment required for performing the flagging work.

02005.4.3 PILOT VEHICLE

When a requirement for the use of pilot vehicles is called for separately in the Bid Schedule, that use will be measured by counting the number of hours each separate vehicle is in actual operation piloting or otherwise directing traffic.

02005.5 BASIS OF PAYMENT

02005.5.1 Unless provided for in the Contract Documents, the cost of all traffic control, including flagman, barricades, pilot cars and other devices, shall be included in the Contract Price and no separate measurement and payment will be provided.

02005.5.2 When provided in the Bid Schedule, the generally accepted quantities for traffic control shall be:

PAYMENT ITEM	UNIT
Traffic Control	Lump Sum
Flaggers	Hours
Pilot Vehicles	Hours

02015.1 DESCRIPTION

This section covers the removal of vegetation, debris, and other obstacles from the defined rights-of-way and limits of the project area and/or construction work site.

02015.1.2 RELATED WORK

Section 01510 - Protection of Existing Properties
Section 02200 - Trench Excavation and Backfill
Section 02500 - Removal and Replacement of Surface Improvements
Section 02900 - Landscaping

02015.1.3 DEFINITIONS

Clearing - consists of removal and disposal of trees, stumps, logs, limbs, sticks, vegetation, rubbish, debris and other material on the natural ground surface.

Grubbing - consists of removing and disposing of roots (one-inch and larger diameter), tree stumps, buried logs, debris, and other underground obstructions.

02015.2 MATERIALS

Not used

02015.3 CONSTRUCTION REQUIREMENTS

Clear, grub, remove and dispose of all trees, vegetation and debris within the staked limits of the roadways, trenches, channels, easements, embankments, structures, and other designated areas. Do not injure or damage trees, shrubs, or other vegetation and objects to remain intact as designated by the Engineer or the Owner. Such items are to be fully protected from injury at the Contractor's expense.

02015.3.1 CLEARING

Areas within the limits of excavation and embankment slope stakes shall be cleared.

Tree branches extending over the area to be cleared and which hang within 12 feet of the ground surface shall be cut off in a neat and workmanlike manner. When such branch removal is necessary, the Contractor shall remove other adjacent branches on the tree under the direction of the Engineer so as to present a balanced appearance. Scars resulting from the removal of branches shall be treated with a heavy coat of approved tree sealant.

02015.3.2 GRUBBING

Grub all areas within the limits described as follows:

02015.3.2.1 FOR CONSTRUCTION OF ROADWAYS - Grub the area between the limits of the excavation and embankment slope stakes to a depth of two (2) feet below natural ground level to remove all stumps, roots, buried logs and other underground debris. However, when the roadway embankment already is two feet or more above the natural ground level, stumps cut less than 6 inches above natural ground, together with roots and other non-perishable obstructions, may remain in place.

02015.3.2.2 FOR CONSTRUCTION OF PONDS OR LAGOONS AND STRUCTURES - completely grub the pond area within the boundaries of the dikes or structures to a depth of two (2) feet and remove all

stumps, roots, buried logs and other underground debris. Grubbing of this area shall include removal of the top 6-inches of organic laden topsoil and stockpiling it for later distribution over areas shown in the Contract Documents or directed by the Engineer.

02015.3.3 BACKFILLING

All stump holes, cuts, depressions and other holes resulting from clearing and grubbing operations within areas designated to receive pipelines, structures, or embankments shall be backfilled and compacted to the density of the surrounding ground.

02015.3.4 DISPOSAL

The Contractor shall dispose of all materials resulting from clearing and grubbing operations as required in the Contract Documents and in accordance with Section 01520 of these Specifications.

02015.3.5 MARKERS, MONUMENTS AND DATA POINTS

Land monuments, property markers or official datum points shall be protected until their removal is approved. When movement of monuments or markers is deemed necessary and approved by the Engineer, all such monuments or markers shall be carefully referenced for re-establishment before removing.

02015.4 METHOD OF MEASUREMENT

02015.4.1 SEPARATE PAYMENT

Measurement for "Clear and Grub" shall be made either as lump sum or by counting the number of acres. to the nearest tenth (10^{th}), of area actually cleared and grubbed within the limits shown on the Drawings or as directed and approved by the Engineer. For areas where ponds or lagoons are to be constructed, this measurement shall include the removal and stockpiling of the first six (6) inches of topsoil in addition to grubbing to the required depths.

02015.4.2 NO MEASUREMENT

02015.4.2.1 NO PAY ITEM FOR CLEAR & GRUB - When the Bid Schedule does not contain a pay item for "Clear and Grub", then that work will be considered incidental to other Work items which require clearing and grubbing and no separate measurement shall be made.

02015.4.2.2 ROADWAY EXCAVATION and/or BORROW - Material used for filling depressions will be measured separately only when "Roadway Excavation" and/or "Borrow" appear as separate pay items on the Bid Schedule. Measurement will be made by counting the number of cubic yards of material moved and placed as designated on the Drawings or as directed and approved by the Engineer. If "Roadway Excavation" or "Borrow" are not included in the Bid Schedule, material used for filling depressions will not be measured separately, but will be considered incidental to the Work.

02015.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price.

PAYMENT ITEM	UNIT
Clear and Grub	Lump Sum
Clear and Grub	10^{th} of Acre

SUBSURFACE INVESTIGATION — SECTION 02020

02020.1 DESCRIPTION

Furnish and provide labor and equipment for investigation of existing miscellaneous pipelines, wires or cables, and other miscellaneous sub-surface features as required by the Engineer.

02020.1.1 RELATED WORK

Section 01510 - Protection of Existing Improvements

02020.1.2 SUBMITTALS

Not used.

02020.1.3 DEFINITIIONS

Not used.

02020.2 MATERIALS

The Contractor shall provide a backhoe and qualified operator; laborer with hand shovel: appropriate fuel and lubricants, necessary equipment servicing materials; and appropriate equipment for transporting the backhoe to perform the investigation. The backhoe shall be a rubber tired CASE 580 backhoe, or an approved unit of equivalent or greater size and capacity, having accumulated not more than 5,000 hours operating time.

02020.3 CONSTRUCTION REQUIREMENTS

02020.3.1 EXPOSURE BY EXCAVATION

When directed by the Engineer, the Contractor shall excavate and expose miscellaneous pipelines, structural features, soil materials and other underground features which may be present at the work site. The location and extent of exposure shall be determined on site by the Engineer. Designation of such areas shall be made in writing, usually in the form of a Work Order, by the Engineer.

02020.3.2 REPLACEMENT OF EXCAVATED MATERIALS

Work required hereunder shall include replacement of excavated materials sufficiently to restore the site to a safe condition as determined by the Engineer. Full restoration of materials such as pavement, concrete slabwork, sod, etc., in the investigated area will be accomplished in accordance with the Contract Documents and as directed by the Engineer.

02020.4 METHOD OF MEASUREMENT

02020.4.1 MEASUREMENT BY HOURS OF WORK

Measurement of subsurface investigation shall be made by counting the actual number of hours of work completed by the machine and operator to investigate miscellaneous underground features as required by the Engineer. No allowance of time will be made for transporting the backhoe to and from the job site when the backhoe is located on the site of the Contract.

02020.4.2 MEASUREMENT FOR OTHER ITEMS OF WORK

When restoration of the excavated area requires provision of pavement, concrete slabwork, sod, etc., separate measurement will be made for those materials in accordance with the respective requirement(s) for measurement of that item in the Contract Documents.

02020.5 BASIS OF PAYMENT

The accepted quantity of work will be paid for at the contract unit price of:

PAYMENT ITEM	UNIT
Subsurface Investigation	Hour

When provision of designated materials is required for restoration of the excavation, payment for such materials shall be made in accordance with the respective provisions of the Contract documents.

02105.1 DESCRIPTION

This section covers obtaining permission, permits, clearances, etc.; as necessary to develop source(s), purchasing or manufacturing, loading, hauling, placing and compacting earthwork materials described herein, as shown on the Drawings and/or required by these Specifications.

02105.1.1 RELATED WORK

Section 02200 - Trench Excavation and Backfill

02105.1.2 SUBMITTALS

When the Bid Schedule indicates quantities of materials described in this section in excess of 50 cubic yards or 50 tons, or when requested otherwise by the Engineer, the Contractor shall provide test results from a certified independent laboratory which has sampled and performed the prescribed test(s) for those materials.

02105.1.3 DEFINITIONS

Granular Material - Material for which the sum of plasticity index (AASHTO T-90) and the percent of material passing a No. 200 sieve (AASHTO T-27) shall not exceed 23.

Silt - Material which passes the No. 200 (AASHTO T-11) sieve and has a plasticity index not greater than 10.

Clay - Material which passes the No. 200 sieve and has a plasticity index greater than 10.

Bedding - Materials placed immediately around and adjacent to pipe installed in trenches.

Borrow - Material obtained from a source away from the site on which installed and/or excavated and used to supplement insufficient quantities of material required.

02105.2 MATERIALS

02105.2.1 ON-SITE TRENCH OR STRUCTURAL BACKFILL

On-site trench or structural backfill consists of material excavated during trenching or foundation excavation which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than 6-inches. Material may be required to be processed or transported along the excavation.

02105.2.2 IMPORTED TRENCH OR STRUCTURAL BACKFILL

Imported trench or structural backfill consists of granular material obtained from sources indicated on the Drawings, designated in the Special Provisions or approved by the Engineer. Borrow materials shall be free of cinders, ashes, wood, vegetative matter, frozen or other deleterious matter with a maximum particle size not greater than 6-inches. Pit Run Borrow may be used as backfill in trenches, excavations for structures, in roadway subgrades, or as otherwise shown on the plans or called for by the Engineer. Material may be processed or may be pit run.

02105.2.3 ON-SITE PIPE BEDDING

On-site pipe bedding consists of material excavated during the trenching operation which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum

particle size not greater than that shown below in Table 1. Material may be required to be processed or transported along the trenching operation.

02105.2.4 IMPORTED PIPE BEDDING

Imported pipe bedding consists of granular material excavated from an approved borrow source which is free of cinders, ashes, wood, vegetation, frozen or other deleterious material or rocks with a maximum particle size not greater than that shown in Table 1 below. Material may be processed or may be pit run.

Table 1 - MAXIMUM PARTICLE SIZE FOR PIPE BEDDING

Pipe	Size
Corrugated Metal and Welded Steel	1”
Polyethylene, Galvanized Steel and PVC	3/4” in Utah or 1”in other states
Ductile Iron, Cast Iron, Concrete, and HDPE	2”

02105.2.5 SAND

Sand shall be graded granular material which passes a 3/8-inch sieve, with not more than 10 percent passing the No. 200 sieve (AASHTO T-27) and free from cinders, ashes, wood, vegetation, frozen or other deleterious material.

02105.2.6 UNTREATED BASE COURSE

Untreated base course consists of processed natural gravel and crushed rock with an approved soil binder without any deleterious materials, tested in accordance with AASHTO T-27 and T-11 which meets the gradation requirements in Table 2 below.

Table2 - PARTICLE SIZE FOR UNTREATED BASE COURSE

Sieve Size	Percent Passing
1-inch	100
½-inch	70-90
#4	40-60
#16	20-40
#200	5-12

02105.2.7 BITUMINOUS SURFACING

Plant mix bituminous material, with maximum particle size not greater than 3/4-inch, meeting the requirements of Section 02511 of these Specifications.

02105.2.8 DRAIN GRAVEL

Drain gravel consists of washed natural gravel or crushed rock, with a maximum particle size of 1-inch, with not more than 40 percent passing the No. 4 sieve, with 100 percent being retained on the No. 10 sieve, and without any deleterious material.

02105.2.9 RIPRAP

Riprap consists of durable, angular, sound and hard field or quarry stones free from cracks and structural defects. Source of supply shall be approved by the Engineer. Fifty percent of the stones shall be of sizes between one-half and two-thirds of the riprap layer thickness shown on the Drawings. Not more then 10-percent of the stones by weight shall be of a size less than one-tenth

of the riprap layer thickness shown on the Drawings and the specific gravity of the stones must range between 2.5 and 2.82 (AASHTO T-85). Durability of the stones shall be in excess of 40 percent (AASHTO T-210).

02105.2.10 SUBGRADE GRANULAR FILL

Subgrade granular fill consists of well graded granular soils with a maximum of 50 percent passing the No. 4 sieve and a maximum of 20 percent passing the No. 200 sieve and no materials greater than 4-inches in diameter.

02105.3 CONSTRUCTION REQUIREMENTS

02105.3.1 LOCAL GOVERNMENT SPECIFICATIONS

Differences may exist between the requirements of these Specifications for sitework materials such as backfill, bedding, untreated base course and bituminous surface course, and those of local government entities. Such differences may affect Contract prices; therefore, when Contract Work falls within the boundaries of any local government, the Contractor shall make himself aware of that entity's specifications for those materials. If differences exist between those specifications and these, unless otherwise approved by the Engineer, the more stringent ones shall apply.

02105.3.2 BORROW AND DISPOSAL SITES

The Contractor shall, at its own expense, secure all necessary access and borrow sites for acquisition or removal and to dispose of excess backfill or waste materials, unless otherwise shown on the Drawings.

02105.3.3 ON-SITE MATERIALS

Unless otherwise shown on the Drawings or directed by the Engineer, on-site pipe bedding and trench backfill will be used for installation of all pipe. In areas where suitable on-site material is not available, other material, which meets these Specifications, will be used when shown on the Drawings, provided for in these Contract Documents or approved by the Engineer.

02105.3.4 SCALES

When ton weight is to be used to determine quantities of earthwork materials used, the Contractor shall provide his own scales or access to other scales at his own cost. Scales shall be certified accurate. Include certification in submittals.

02105.4 METHOD OF MEASUREMENT

02105.4.1 NO MEASUREMENT

On-Site Pipe Bedding and On-site Trench or Structural Backfill will be considered part of the items for piping or excavation associated with structures included in the Bid Schedule and no separate measurement for these materials will be made.

02105.4.2 SEPARATE MEASUREMENT

02105.4.2.1 IMPORTED MATERIALS – Quantities of imported pipe bedding and imported trench or structural backfill shall be determined by measuring the lineal feet (lineal feet of trench requiring imported materials) of imported material in place and accepted. This measurement shall include furnishing all necessary materials and equipment, labor, hauling, placement, compaction, and testing to produce an acceptable trench fill.

No allowance will be made for bedding and backfill materials required to fill voids caused by trenching operations, which exceed the dimensions shown on the Drawings.

02105.4.2.2 SAND – Quantities of sand shall be determined in cubic yards in place, calculated by multiplying the measured length of trench by the measured depth of bedding by the pay width shown on the Drawings, or as directed by the Engineer in the field.

No allowance will be made for materials required to fill voids caused by trenching operations, which exceed the dimensions shown on the Drawings.

02105.4.2.3 UNTREATED BASE COURSE - Quantities of untreated base course shall be determined in cubic yards in place, calculated by multiplying the measured length by neat line dimension shown on the drawings. If no neat lines are shown on the drawings, then the cubic yard calculations shall be determined by actual measurements in the field in place.

02105.4.2.4 BITUMINOUS SURFACING – Quantities of the respective compacted thickness of bituminous surfacing shall be determined in square yards by multiplying the length of material in place and accepted by the pay width shown on the Drawings, or as directed by the Engineer in the field.

02105.4.2.5 DRAIN GRAVEL - Quantities of drain gravel shall be determined in cubic yards calculated by multiplying the measured length by the measured depth of bedding in place by the pay width shown on the Drawings, or as directed by the Engineer in the field.

02105.4.2.6 RIPRAP - Quantities of riprap shall be determined in cubic yards by multiplying the measured length by the measured breadth by the measured average depth of material in place and accepted.

02105.4.2.7 SUBGRADE GRANULAR FILL - Quantities of subgrade granular fill shall be determined in cubic yards by multiplying the measured length by the measured breadth by the measured depth of material in place and accepted.

02105.5 BASIS OF PAYMENT

The accepted quantity shall be paid for at the contract unit price for:

PAYMENT ITEM	UNIT
Imported Trench or Structural Backfill	Lineal Foot
Imported Pipe Bedding	Lineal Foot
Sand	Cubic Yard
Untreated Base Course	Cubic Yard
Bituminous Surfacing (Thickness)	Square Yard
Drain Gravel	Cubic Yard
Riprap	Cubic Yard
Subgrade Granular Fill	Cubic Yard

02200.1 DESCRIPTION

This section covers furnishing of equipment, labor, and materials to clear, excavate, backfill and compact trenches for utilities. Excavation and backfill for piping appurtenances such as manholes, inlets, transition structures, junction structures, vaults, thrust blocks, valve boxes, catch basins, etc., shall be included, as also shall be restoration of the disturbed ground surface in accordance with the Contract Documents.

02200.1.1 RELATED WORK

Section 02005 – Traffic Control
Section 01510 - Protection of Existing Properties
Section 02015 - Clearing and Grubbing
Section 02105 - Earthwork Materials
Section 02208 - Flowable Backfill
Section 02222 - Water Pipe Installation
Section 02224 - Sewer Pipe and Manhole Installation
Section 02315 - Boring and Jacking
Section 02320 - Pipe Encasement
Section 02500 - Removal and Replacement of Surface Improvements
Section 02900 – Landscaping
Section 02204 – Water for Construction

02200.1.2 SUBMITTALS

02200.1.2.1 MOISTURE DENSITY TESTING AND GRADATION DETERMINATIONS - A documentation system shall be maintained by the Contractor to record results from all moisture/density testing and gradation determinations. Records of these tests shall show the following information as a minimum:

- Date of test.
- Type of test.
- Name of person performing test.
- Location of sample taken.
- Results of test and comparison with specified value required for compliance.

Upon completion of each gradation test or moisture/density test, a copy of the record for the respective test shall be delivered to the Engineer within one (1) working day following the completion.

02200.1.2.2 COMPLIANCE TESTING - Documentation shall also be made, in field diaries, of all compliance tests performed by the Contractor. Documentation shall be made available to the Engineer upon request.

02200.1.3 DEFINITIONS

Trench Width - Shall not be more than 18 inches greater than the outside diameter of the pipe being installed at a point 12 inches above the top of the pipe unless otherwise shown on the Drawings. The width of the trench above that level shall be the minimum width required for safe working conditions, sheeting, bracing and for proper installation of the work.

Trench Grade - The vertical elevation of the flowline of the pipe being installed in the trench.

Open Trench - Shall include trench sections which have been excavated and are awaiting completion of pipe installation, backfill, compaction or installation of a temporary surface.

Surface Restoration - Shall include the Work required to restore the ground surface disturbed for trench excavation. Replacement of road surfacing, planting and landscaping removed for trench excavation, will not be considered as trench excavation and backfilling.

Consolidated Backfill - A condition of backfilling for which a specified compaction density is required. Maximum lift, prior to compaction, for consolidated backfill shall be 8 inches unless otherwise approved by the Engineer.

Unconsolidated Backfill - A condition of backfilling for which no compaction density is specified and the required compaction effort is layer placing and then compacting by wheel rolling or use of compacting equipment. Lifts of up to 24 inches are allowed for unconsolidated backfill.

Unclassified Excavation - A determination for excavating whereby no consideration will be given to different kinds of materials that are encountered.

02200.2 MATERIALS

Not used.

02200.3 CONSTRUCTION REQUIREMENTS

02200.3.1 PERMITS

For work which is to take place within state and/or federal road and highway rights-of-way, the Contractor shall be responsible for obtaining all required encroachment and construction permits prior to beginning any work within the rights-of-way.

All work in any city, town or county public right-of-way will also require an approved excavation permit from that entity. The Contractor shall be responsible for obtaining all required encroachment and construction permits prior to beginning any work within the rights-of-way.

02200.3.2 CLEARING AND GRUBBING

On areas outside of established roadways, the area to be disturbed by the trenching operation shall be cleared and grubbed in accordance with Section 02015 prior to beginning the trenching operation.

02200.3.3 EXCAVATION

02200.3.3.1 UNCLASSIFIED EXCAVATION - All excavation for this project shall be unclassified excavation, unless otherwise determined by the Engineer.

02200.3.3.2 STAKING - Location staking of piping will be provided by the Owner in accordance with the provisions of Section 1560 unless indicated otherwise in the Contract Documents.

02200.3.3.3 EXPOSURE OF UNDERGROUND FEATURES - Before any trench excavation is started, the Contractor shall locate and expose all existing underground utilities, structures, etc., which may interfere with, or conflict with, the trench being excavated. In case of conflicts, the Contractor shall make adjustments in the location of the excavation at the direction of the Engineer. Such adjustments shall be made at no additional cost to the Owner.

02200.3.3.4 The Contractor shall perform all excavation to the depth specified in the Drawings and/or as required to accomplish the Work. During the excavation operations, excavated materials which are suitable for use as backfill for trenches or around structures, shall be piled separately at sufficient distance from the edge of the excavation to be out of the way of equipment and to

prevent slides and cave-ins from embankment overloading. All excavated materials not suitable for, or not required for, fill or backfill shall be separated and removed promptly from the site of the Work and disposed in an approved site in accordance with Section 1520.

02200.3.3.5 PUBLIC TRAVEL - Materials excavated within roadways, regardless of their disposition, shall be piled in such manner that will cause the minimum of inconvenience to public travel and always allow for emergency vehicle passage.

02200.3.3.6 OPEN TRENCH - At no time shall the Contractor allow more than 500 cumulative feet of trench to be open for the overall project, unless otherwise approved by the Engineer.

02200.3.3.7 SHORING - Shoring and/or trench boxes shall be used wherever needed to protect workers and adjacent structures and property of the Work in accordance with OSHA requirements. The arrangement of bracing of shoring shall not be set so as to stress any portion of completed work.

02200.3.3.8 BARRICADING OPEN WORK - Excavations left open at the end of the work day shall be surrounded by barricades and warning tape.

02200.3.4 EXCAVATION IN ROCK

02200.3.4.1 SOLID ROCK EXCAVATION – If:

- The Contract Documents contain provisions for “Solid Rock Excavation”, and
- If rock has been encountered in the excavation, and
- If the Contractor has made three attempts to remove the rock using a "Kelly" or similar type ripper having not less than 235 fly wheel horsepower, then

the excavation of such material will be considered as "solid rock excavation".

02200.3.4.2 BLASTING - When blasting is deemed necessary for rock removal, the Contractor shall comply with all applicable State and Local laws, ordinances, and provisions for blasting safety and obtain written approval from the Engineer prior to starting of drilling and/or blasting operations.

In all cases, blasting shall be performed by experienced, qualified blasters. The Contractor is responsible for any and all damage caused by blasting, and blasting will not be allowed within 15 feet of any existing structures.

02200.3.5 OVER-EXCAVATION

02200.3.5.1 UNAUTHORIZED OVER-EXCAVATION - Care shall be taken to not excavate below the depth required by the Drawings. Any unauthorized over-excavation shall be refilled and compacted with material meeting the requirements of Section 02105 and approved for use by the Engineer at the expense of Contractor.

02200.3.5.2 ROCK - Whenever rock is encountered in the trench bottom, the trench shall be over-excavated a minimum of 6 inches below the design elevation of the bottom. of the pipe. The over-excavated portion of the trench shall be filled with approved bedding material and the bedding compacted, all at the expense of the Contractor, unless otherwise approved by the Engineer and the Owner.

02200.3.5.3 UNSTABLE NATIVE FORMATIONS - The Contractor shall notify the Engineer if soft, spongy, or otherwise unstable native formations, that are not suitable for structure or pipeline foundations, are encountered in excavations. In the event the Engineer determines that the existing foundation materials are unacceptable, the Contractor will be directed to over-excavate, remove and replace the unsuitable soil materials. The over-excavation shall be backfilled with approved select materials and compacted in accordance with the requirements described herein. Such situation

will be considered as a changed condition and the Contractor will be compensated in accordance with Subsection 00700.13 of the General Conditions.

02200.3.6 PIPELINE ACCESSORY INSTALLATION

02200.3.6.1 EXCAVATION FOR ACCESSORIES - The Contractor may excavate to place the sides of manholes, vaults, valve boxes, inlet structures, catch basins or other accessory structures directly against the excavated surface, provided that the faces of the excavation are firm and unyielding and are at all points outside the structure lines shown on the plans. If the native material is such that it will not stand without sloughing, the Contractor shall over-excavate to place the structure and this over-excavation shall be backfilled and compacted, using the same material required for the adjoining pipeline trench.

02200.3.6.2 ACCESSORY SUPPORT - To prevent displacement of valve boxes and other accessory structures, trench backfill shall be compacted to at least 95% of maximum density as determined by AASHTO T-99 for 6 feet along the trench on each side of the box or structure.

02200.3.7 TRENCH BOTTOM PREPARATION

The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe. Bell or coupling holes shall be made in accordance with the recommendations of the pipe manufacturer after the trench bottom has been graded. Such depressions shall be of sufficient width to provide clearance for connecting and/or bolting. Holes for depressions shall be excavated only as necessary to permit proper joining of pipe sections.

02200.3.8 SURFACE IMPROVEMENTS

When surface improvements must be removed, or are damaged or disturbed by the Work, their removal and restoration shall be accomplished by the Contractor in accordance with Sections 01510 and 02500 of these Specifications.

02200.3.9 PROTECTION OF EXISTING UTILITIES

The Contractor shall protect all existing utilities, either above or below ground, in accordance with the provisions of Section 01510 of these Specifications.

02200.3.10 IRRIGATION DITCHES, PIPES AND STRUCTURES

The Contractor shall contact the owners of all irrigation facilities to be encountered by the work and make arrangements for construction clearances and/or facility shutdown schedules. All irrigation ditches, dikes, headgates, pipe, valves, culverts, etc., damaged or removed by the Contractor shall be restored by the Contractor to their original condition, or better, in accordance with Section 02500 of these Specifications, at no additional cost to the Owner.

02200.3.11 BUILDING FOUNDATIONS AND STRUCTURES

Where trenches are located adjacent to building foundations and structures, the Contractor shall take all necessary precaution against damage to such facilities. Water settling of backfill material in trenches adjacent to structures will not be permitted unless authorized in writing by the Engineer. The Contractor shall be liable for any damage caused by the construction, and shall restore or replace damaged property in accordance with Section 02500 of these Specifications.

02200.3.11.1 SIDEWALK, CURB AND GUTTER - Where sidewalk, curb, and gutter exist, excavation may be made by tunneling provided the following requirements are met. Excavation shall be vertical and as near to the curb or sidewalk as possible. The length of the tunnel shall not exceed the width of

the sidewalk, curb and gutter. Where a separate sidewalk and curb exist, an excavation shall be made between the sidewalk and the curb. At least three feet of undisturbed earth shall be left under the sidewalk. Where the excavation does not meet these requirements, a section of sidewalk from joint to joint shall be removed and replaced.

Gas Lines and Water Lines may be jacked, augured or jetted under sidewalk, curb and gutter provided the resulting hole diameter does not exceed one (1) inch plus the outside diameter of the pipe installed.

Backfill of Sidewalk Tunnels. Where the sidewalk has been tunneled, the hole shall be filled from each end with earth compacted with mechanical tampers to 90% of AASHTO T-180, Method C. A 3'-0" section of trench on each side of the tunnel and any space between the sidewalk and curb shall be backfilled with mechanically compacted earth as specified.

02200.3.12 WATER

02200.3.12.1 WATER FLOW - The Contractor's operation shall always ensure the free flow of water in gutters, culverts, and natural watercourses. In irrigated land areas, excavated materials shall be piled on the downhill sides of trenches.

02200.3.12.2 GROUNDWATER – Unless provided with geotechnical information by the Owner, the Contractor shall have the responsibility of determining the presence and location of groundwater at the work site.

02200.3.12.3 DEWATERING - Grading and other protective measures shall be performed as necessary to prevent surface or ground water from flowing into trenches or other excavations. Any water accumulated therein during construction, from surface or from underground sources, shall be promptly removed by pumping or by other approved methods at the Contractor's expense.

Unless given as a separate item in the Bid Schedule, dewatering shall be performed at the expense of the Contractor. When geotechnical information is given, groundwater must be in excess of ± 2 feet before a change in work will be considered.

02200.3.12.4 INSTALLATION IN WATER - No backfill, subgrade materials, concrete or masonry footings, foundations, floors, equipment, or pipe shall be placed or laid in water. Water shall not be allowed to rise over such work for at least 24 hours following the pour or placement of any concrete or mortar used in the work. Water shall not be allowed to rise unequally against structure walls for a period of 14 days following concrete placement or masonry erection.

Groundwater or surface water in piping trenches shall not be allowed to enter and flow through the piping while installation of pipe is in progress.

02200.3.12.5 DISPOSAL - The Contractor shall dispose of all water from the work in a suitable manner without damage to adjacent property

02200.3.13 BEDDING AND PIPELINES

02200.3.13.1 USE OF ON-SITE MATERIALS - Unless directed otherwise in these Specifications, on-site materials complying with Section 02105 shall be used for bedding. If an act, or failure to act on the part of the Contractor creates a need to use imported bedding materials, the Contractor shall bear the cost of all additional excavation, transportation and installation for new bedding, and for removal and disposal of unacceptable materials, as required to correct that situation.

02200.3.13.2 INSUFFICIENT ON-SITE MATERIALS - When sufficient bedding material cannot be developed from on-site materials, and no provision is contained in the Contract Documents for importing

bedding materials, the Engineer shall be notified as soon as possible. Alternative measures will be considered and a change can then be negotiated to provide additional materials in accordance with the General Conditions.

02200.3.13.3 BEDDING INSTALLATION - Pipe bedding shall be installed according to applicable sections of these Specifications for pipeline construction.

02200.3.14 BACKFILL

02200.3.14.1 BACKFILL MATERIALS AND PLACEMENT - Backfill shall be accomplished using acceptable materials as described in Section 02105 as follows:

- All backfill materials shall be at ± 2% of optimum moisture content when placed in the trench or other excavation.
- Unless provided otherwise on the Drawings, consolidated trench backfill shall be placed in lifts not greater than 8 inches.
- Unsuitable excavated material, or material with incorrect moisture content shall be removed and replaced.
- Soft spongy material that causes areas which "pump" when heavy loads pass over them, shall be removed and replaced with suitable material.
- Dry material that will not "ball" shall be removed and replaced.

  (The two foregoing conditions shall be considered sufficient evidence, without further testing, that the moisture content is incorrect and shall be grounds for removal and replacement of the material. Such replacement, if required, shall be at the sole expense of the Contractor.)

- Placement of backfill against cast-in-place concrete structures shall not be started until the concrete has been cured for the time required by the Contract Documents or prescribed by the Engineer.

02200.3.14.2 COMPACTION – Compaction procedures shall be as follows:

- The Contractor shall be responsible for obtaining construction water needed for compaction in accordance with Section 02204 of these Specifications.
- Bedding and consolidated backfill material shall be compacted with tamping, vibrating or conventional wheeled compaction equipment. Use care not to damage pipe while compacting bedding materials.
- The use of wheel rolling for compaction shall only be approved for compacting unconsolidated backfill materials.
- For work within state or federal highway rights-of-way, compaction shall meet the requirements of the respective applicable specifications.
- Backfill shall be thoroughly compacted to densities not less than those shown in the following table:

TABLE OF MINIMUM DENSITY REQUIREMENTS

(based on AASHTO-99 and T-91 and on ASTM D-2922 and E-3017)

Location	From Surface to 2-Feet Below Surface	From 2-Feet Below Surface to Top of Bedding	Bedding
Within 6 feet of, and/or under, any existing or proposed structure, pavement, curb, sidewalk, roadway or similar construction included in the Contract:	100% for granular and 95% for non-granular materials	95% for all materials	95% at all locations

Location	From Surface to 2-Feet Below Surface	From 2-Feet Below Surface to Top of Bedding	Bedding
Around any structure outside 6 feet:	90% for all materials	90% for all materials	90% at all locations
Cultivated and landscaped areas:	85% for all materials	85% for all materials	85% at all locations
Undeveloped Land:	Unconsolidated – see definition	Unconsolidated - see definition	85% at all locations

02200.3.15 SETTLING AND SUBSIDENCE

Dips or uneven surfaces caused by subsidence or post-construction settlement of fill or backfill in any trenches, excavations, fills, or embankments within the work, which become apparent within the warranty period, shall be repaired by the Contractor at no additional cost to the Owner.

02200.3.16 SAMPLING AND TESTING

02200.3.16.1 TESTING BY INDEPENDENT LABORATORY - As directed by the Engineer, the Contractor shall provide for all sampling and testing through a qualified, independent testing laboratory at the Contractor's own expense.

02200.3.16.2 SCHEDULE OF SAMPLING AND TESTING - The following schedule of sampling and testing provides minimum requirements, to assure compliance with all materials and compaction requirements described herein. The number of samples and tests shown shall be considered minimum, and field conditions may necessitate additional sampling and testing to be required by the Engineer.

GRADATION DETERMINATION (AASHTO T-27 and T-11)

Trench Location	Testing Required
Materials imported or manufactured at a site determined by this contract	One test per site or source
On-site excavated materials along trenches.	One test per geographical area where material composition and gradation visually appears consistent.

MOISTURE/DENSITY RELATIONSHIP (Proctor)
(AASHTO T-99 or T-180 Method D)

Trench Location	Testing Required
Materials imported or manufactured at a site determined by this Contract.	One test per site unless the material visually appears to change.
On-site excavated materials along trenches.	One test per geographical area where material composition visually appears consistent.

COMPACTION COMPLIANCE TESTING REQUIREMENTS
(AASHTO T-191 or Portable Nuclear Gauges)

Trench Location	Testing Required
Street crossing with gravel or bituminous surfacing.	One test per lift for each crossing.
Parallel to centerline of bituminous or gravel surfaced streets or roadways.	One test per lift for each 500-feet of trench length.
Along unsurfaced roads or in cultivated or landscaped areas.	One test per lift for each 1,000-feet of trench length with at least one test per area.
Under or adjacent to manholes, wetwells, enclosures, boxes, etc.	None, unless geological conditions are inconsistent and requested by the Engineer.

NOTE: The term "test" shall mean a single test with acceptable results, equal to or better than specified minimums. In the event compaction test results fall below the required minimum density; the Contractor shall re-compact and test the material until a test with acceptable results is obtained. Any test failure shall result in additional tests as required by the Engineer, at no cost to the Owner, to ensure that overall project quality objectives are met.

02200.4 METHOD OF MEASUREMENT

02200.4.1 NO MEASUREMENT

02200.4.1.1 SOLID ROCK EXCAVATION - Unless the Contract Documents contain provisions for "Solid Rock Excavation", no separate measurement or payment will be made for work requiring rock excavation.

02200.4.1.2 TRENCH EXCAVATION AND BACKFILL - Trench excavation and backfill will be considered incidental to other items shown in the Bid Schedule and separate measurement will not be made unless prescribed otherwise in the Contract Documents.

02200.4.2 SEPARATE MEASUREMENT

When listed as a separate item in the bid schedule, quantities of solid rock excavation shall be determined by the foot/foot unit, using a tape measure or other accurate measuring device to find the length of cut in lineal feet along the plane of cut and the average depth of cut in the rock and multiplying the two numbers together. This measurement shall include all labor, equipment, materials, and related work, including, but not limited to, ripping, sawing, boring, hammering, blasting, rock trenching, excavating, removing, hauling, and disposal, if required, of the existing bedrock deemed qualified by the Engineer for payment of completed rock excavation.

02200.5 BASIS OF PAYMENT

Separate payment will not be made for trench excavation unless prescribed otherwise in the Contract Documents.

PAYMENT ITEM	UNIT
Solid Rock Excavation	Foot/Foot

02201.1 DESCRIPTION

This section covers furnishing all equipment, labor, and other facilities to excavate, remove, backfill, compact, grade and shape earth materials required for construction of buildings, bridges, retaining walls, head walls, box culverts and other structures, in accordance with the Contract Documents.

02201.1.1 RELATED WORK

Section 01510 - Protection of Existing Properties
Section 02015 - Clearing and Grubbing
Section 02105 - Earthwork Materials
Section 02500 - Removal and Replacement of Surface Improvements
Section 02900 - Landscaping

02201.1.2 SUBMITTALS

Not used.

02201.1.3 DEFINITIONS

Consolidated Backfill - A condition of backfilling for which a specified compaction density is required. Maximum allowable lifts for consolidated backfill under this Section shall be 8 inches unless otherwise approved by the Engineer.

Unconsolidated Backfill - A condition of backfilling for which no compaction density is specified and the required compaction effort is layer placing and then compacting by wheel rolling or use of compacting equipment. Lifts of up to 24 inches are allowed for unconsolidated backfill.

Unclassified Excavation - A determination for excavating whereby no consideration will be given to different kinds of materials that are encountered.

Embankment Fill - The placement and compaction of suitable materials to raise the existing grade to the established elevations, and the placement and compaction of suitable materials within areas where unsuitable materials have been removed. Maximum lift for embankment fill under this Section shall be 6 inches unless otherwise approved by the Engineer.

02201.2 MATERIALS

Not used

02201.3 CONSTRUCTION REQUIREMENTS

02201.3.1 PERMITS

For work within state or federal highway rights-of-way, the Contractor shall be responsible for obtaining all required encroachment and construction permits prior to beginning any work within the rights-of-way.

02201.3.2 SITE PREPARATION

02201.3.2.1 CLEARING THE SURFACE - Before proceeding with any ground surface disturbances for work under this Section, the area to be disturbed by excavation, grading or embankments shall be cleared and grubbed in accordance with Section 02015.

02201.3.2.2 TOPSOIL - Unless otherwise indicated, the Contractor will not be required to separate, stockpile and replace topsoil on the Work site. When required in the Contract Documents, topsoil shall be removed and stockpiled for later distribution in accordance with Section 02015.

02201.3.2.3 REMOVAL OF SUBSURFACE MATERIALS - Following completion of clearing and grubbing, the Contractor shall locate and remove existing underground debris, posts, piping, cables and other underground obstructions. Unless indicated otherwise in the Contract Documents, no separate allowance for costs associated with removal of these materials will be allowed to the Contractor.

02201.3.2.4 RELOCATION OF UNDERGROUND UTILITIES - When required by the Contract Documents or determined necessary by the Engineer, existing underground utilities or other objects shall be relocated to provide clearance for required structural components prior to starting any structural excavation.

02201.3.3 EXCAVATION

02201.3.3.1 UNCLASSIFIED EXCAVATION - All excavation shall be unclassified, unless otherwise indicated in the Contract Documents. The Contractor shall perform all excavation to the elevations and dimensions shown on the Drawings and/or as required to accomplish the Work.

02201.3.3.2 CUT SLOPES - Unless otherwise shown on the Drawings, or directed by the Engineer, cut and fill slopes, or cut slopes in soil, shall be no steeper than two horizontal to one vertical. Cut slopes in rock shall be no steeper than 1.5 horizontal to one vertical.

02201.3.3.3 STOCKPILING AND DISPOSAL OF EXCAVATED MATERIALS - During the excavation operations, excavated materials which are suitable for use as backfill or embankments around structures, shall be piled separately at sufficient distance from the opening to be out of the way of equipment and to prevent slides or cave-ins.

All excavated materials not suitable, or not required, for fill or backfill shall be removed promptly from the site of the Work and disposed of in accordance with Section 01520.

Excavated materials, regardless of their disposition, shall be piled in such manner that will cause the minimum of inconvenience to public travel, and provisions shall be made for emergency travel as necessary.

02201.3.3.4 SHORING AND BRACING - Shoring or bracing shall be provided in accordance with OSHA safety requirements on all excavations, to protect workmen and the progression of the Work. In addition, excavation walls shall be braced and supported as required to prevent ground collapse or movement of ground surfaces and structures adjacent to the excavation. Slides or settlements, which occur in the excavation, shall be promptly removed and corrected by the Contractor. The arrangement of shoring and bracing components shall be made so as not to place any stress on portions of completed work.

02201.3.4 EXCAVATION IN ROCK

02201.3.4.1 SOLID ROCK EXCAVATION - Demonstration of the presence of "solid rock excavation" may constitute a changed condition, and the Contractor will be compensated for removal of such material in accordance with the General Conditions. Before excavation will be considered as "solid rock excavation", the Contractor shall demonstrate an inability to remove rock by making three attempts to rip the rock using equipment having not less than 235 fly wheel horsepower with a "Kelly" or similar type ripper. After such demonstration has indicated the presence of solid rock, and the Engineer determines its removal is necessary, authorization for removal of the solid rock may be granted in accordance with Section 00700.13 of the General Conditions.

02201.3.4.2 BLASTING - When blasting is deemed necessary for rock removal, the Contractor shall comply with all applicable State and Local laws, ordinances, and provisions for blasting safety and obtain written approval from the Engineer prior to starting of drilling and/or blasting operations.

In all cases, blasting shall be performed by experienced, qualified blasters. The Contractor is responsible for any and all damage caused by blasting, and blasting will not be allowed within 15 feet of any existing structures.

02201.3.5 OVER-EXCAVATION

02201.3.5.1 UNAUTHORIZED OVER-EXCAVATION - Care shall be taken not to excavate below the depth required by the Drawings. Any unauthorized over-excavation shall be refilled and compacted with material meeting the requirements of Section 02105 and approved for use by the Engineer at the expense of Contractor.

02201.3.5.2 UNSTABLE NATIVE FORMATIONS - The Contractor shall notify the Engineer if soft, spongy, or otherwise unstable native formations, unsuitable for structure foundations, are encountered during excavation. In the event the Engineer determines that such formations are inadequate, the Contractor will be directed to over-excavate and remove the unsuitable materials. The over-excavation shall be backfilled with approved select materials and compacted in accordance with the requirements described herein. Such situation will be considered as a changed condition and the Contractor will be compensated in accordance with the General Conditions.

02201.3.6 WATER

02201.3.6.1 DEWATERING - The Contractor shall control all ground or surface water during excavation, grading and subsequent construction activities. Dewatering systems shall be provided and operated by the Contractor so as to prevent the removal of the natural soils. Grading shall be performed as necessary to prevent surface water from flowing into excavations. Any water accumulated, therein during construction, shall be promptly removed by pumping or by other approved methods at the Contractor's expense.

Dewatering efforts shall be sufficient to ensure that softening of the bottom of excavations or formation of "quick" conditions or "boils" shall be prevented. Natural or compacted materials within the excavated areas, softened by saturation with ground water or standing surface water, shall be removed and replaced as instructed by the Engineer, at no additional cost to the Owner.

02201.3.6.2 INSTALLATION IN WATER - No backfill, subgrade materials, concrete or masonry footings, foundations, floors, equipment, or pipe shall be placed or laid in water. Water shall not be allowed to rise over such work for at least 24 hours following the pour or placement of any concrete or mortar used in the Work. Water shall not be allowed to rise unequally against structure walls for a period of 14 days following concrete placement or masonry erection.

02201.3.6.3 DISPOSAL - Any water to be removed from the Work site shall be disposed of by the Contractor in a suitable manner without damage to adjacent property.

02201.3.6.4 REFERENCE - See also Section 02200.3.12.

02201.3.7 SCARIFICATION

After excavating to the lowest subgrade elevation shown on the Drawings, and prior to placement of the structure footings or foundation components, unless otherwise directed by the Engineer, the top 6 inches of the subgrade shall be scarified, brought to the proper moisture content, and compacted in accordance with the Table of Minimum Density Requirements below.

02201.3.8 EMBANKMENT FILL AND BACKFILL

02201.3.8.1 ON-SITE BACKFILL MATERIALS - Unless directed otherwise by the Engineer or the Contract Documents, on-site materials complying with Section 02105 shall be used for all embankment, fill and backfill materials. Before on-site material becomes unavailable, and when provisions are not included in the Contract Documents for importing suitable materials, the Contractor shall notify the Engineer so that a change can be negotiated in accordance with the General Conditions.

02201.3.8.2 PLACEMENT IN LIFTS - Unless provided otherwise on the Drawings, suitable embankment fill, backfill, and bedding materials shall be placed in lifts which will be not greater than 6 inches thick after compaction. Bedding materials shall be moisture conditioned (by wetting or drying), before being placed in layers for compaction in accordance with the requirements of the Table of Minimum Density Requirements below.

02201.3.8.3 UNSUITABLE FILL AND BACKFILL MATERIALS - Any unsuitable fill and/or backfill material found within excavated materials, or material with incorrect moisture content shall be removed and replaced. Soft spongy material, causing areas that "pump" when heavy loads are passed over them, shall be removed and replaced with suitable material. Dry material that will not "ball" shall be removed and replaced. The two foregoing conditions shall be considered sufficient evidence, without further testing, that the moisture content is incorrect and shall be grounds for removal and replacement of the material. Such replacement if required shall be at the sole expense of the Contractor, and shall be accomplished prior to placement of any further material.

02201.3.9 COMPACTION

02201.3.9.1 MININUM DENSITY REQUIREMENTS - After placement, all materials shall be thoroughly compacted to not less than the densities indicated in the table below. Compaction shall be achieved and verified in accordance with AASHTO T-99, ASTM D-1556, ASTM D-1557, ASTM D-2922 and/or ASTM D-3017 as applicable.

TABLE OF MINIMUM DENSITY REQUIREMENTS
(based on AASHTO-99 and T-91 and on ASTM D-2922 and E-3017)

Location	From Surface to 2-Feet Below Surface	From 2-Feet Below Surface to Top of Bedding	Bedding
Within 6 feet of, and/or under, any existing or proposed structure, pavement, curb, sidewalk or similar construction included in the Contract:	100% for granular and 95% for non-granular materials	95% for all materials	95% at all locations
Around any structure outside 6 feet:	90% for all materials	90% for all materials	90% at all locations
Cultivated and landscaped areas:	85% for all materials	85% for all materials	85% at all locations
Undeveloped land:	Unconsolidated - see 02201.1.3	Unconsolidated - see 02201.1.3	85% at all locations

02201.3.9.2 OTHER SPECIFICATIONS - For work within state or federal highway rights-of-way, compaction shall meet the requirements of the respective applicable specifications.

02201.3.9.3 COMPACTION EQUIPMENT - Embankment fill and consolidated backfill material shall be compacted with conventional tamping or vibrating compaction equipment of such capacity and weight to achieve the required compaction density. The use of wheel rolling for compaction shall only be approved for compacting unconsolidated backfill materials.

02201.3.9.4 PLACEMENT AGAINST STRUCTURES - Embankment fill or backfilling against cast-in-place concrete structures shall not be started until the concrete has been cured for the time required by these Specifications or prescribed by the Engineer. Compaction within 3 feet of any new or existing structure shall be by hand operated vibratory or tamping equipment.

02201.3.9.5 CONSTRUCTION WATER - The Contractor shall be responsible for obtaining construction water needed for compaction in accordance with Section 02204.

02201.3.10 SETTLING AND SUBSIDENCE

Dips or settlement of fill or backfill in any excavation or embankment within the Work, which occur within the warranty period, shall be repaired by the Contractor at no additional cost to the Owner.

02201.3.11 SAMPLING AND TESTING

02201.3.11.1 INDEPENDENT LABORATORY - The Contractor shall provide all required sampling and testing by an independent qualified testing laboratory as directed by the Engineer.

02201.3.11.2 SCHEDULE OF SAMPLING AND TESTING - The following schedule of sampling and testing provides minimum requirements, to assure compliance with all materials and compaction requirements described herein. The number of samples and tests shown shall be considered minimum, and field conditions may necessitate additional sampling and testing to be required by the Engineer.

GRADATION DETERMINATION (AASHTO T-27 and T-11)

Location	Testing Required
Materials imported or manufactured at a site determined by this contract	One test per site or source
On-site excavated materials along trenches	One test per geographical area where material composition and gradation visually appears consistent.

MOISTURE/DENSITY RELATIONSHIP (Proctor)
(AASHTO T-99 or T-180 Method D)

Location	Testing Required
Materials imported or manufactured at a site determined by this Contract.	One test per site unless the material visually appears to change.
On-site excavated materials along trenches.	One test per geographical area where material composition visually appears consistent.

COMPACTION COMPLIANCE TESTING REQUIREMENTS
(AASHTO T-191 or Portable Nuclear Gauges)

Location	Testing Required
Under Structure footing or foundation	One test per lift for each 100 linear feet.
Within an embankment erected to support a structure under structure floor slabs	One test per lift for each 1,000 square feet.
Within embankments for cultivated or landscaped areas.	One test per lift for each 5,000 square feet.

NOTE: The term "test" shall mean a single test with acceptable results, equal to or better than specified minimums. In the event compaction test results fall below the required minimum density; the Contractor shall re-compact and test the material until a test with acceptable results is obtained.

02201.3.12 GRADING

Upon completion of excavation, the site shall be accurately graded to the spot elevations and slopes shown on the Drawings, to allow proper installation of the structure in accordance with applicable Sections of these Specifications.

02201.4 METHOD OF MEASUREMENT

02201.4.1 NO MEASUREMENT

Separate measurement will not be made for earthwork for structures. Unless the Contract Documents contain provisions for "Solid Rock Excavation", no separate measurement or payment will be made for work requiring rock excavation.

02201.4.2 SEPARATE MEASUREMENT

When listed as a separate item in the Bid Schedule, quantities of solid rock excavation shall be determined by the foot/foot unit, using a tape measure or other accurate measuring device to find the length of cut in lineal feet along the plane of cut and the average depth of cut in the rock and multiplying the two numbers together. This measurement shall include all labor, equipment, materials, and related work, including, but not limited to, ripping, sawing, boring, hammering, blasting, rock trenching, excavating, removing, hauling, and disposal, if required, of the existing bedrock deemed qualified by the Engineer for payment of completed rock excavation.

02201.5 BASIS OF PAYMENT

Payment for earthwork for structures shall be included in the unit prices provided for the respective structure elements listed in the Bid Schedule. When listed as a separate item on the Bid Schedule, payment for "Solid Rock Excavation" will be made as follows:

PAYMENT ITEM	UNIT
Solid Rock Excavation	Foot/Foot

02202.1 DESCRIPTION

This section covers construction of roadways and embankments, roadway ditches, channel changes, furrows, slope rounding, benches, berms, dips, approaches, and subsidiary work.

02202.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 02208 – Flowable Backfill (required during winter months)

02202.1.2 SUBMITTALS

Not used.

02202.1.3 DEFINITIONS

Roadway - The graded portion of a road within the top of cut slopes and the toe of embankment slopes, excavated and placed to form a surface for vehicular travel.

Excavation - That portion of the roadway which is removed from its original position and deposited within the roadway as embankment.

Embankment - Excavated earth materials moved from an original source and placed within the roadway.

Unsuitable Material - Excavated earth materials determined by the Engineer to be unsuitable for placement in roadway embankment. Such materials may include rock too large for placement in embankment, topsoil containing excessive vegetative debris, unstable earth materials, etc.

Roadbed - That portion of the roadway graded to the surface upon which vehicles travel, including the shoulders.

Subgrade - The graded roadbed finished according to the details shown on the Drawings and prepared to receive surfacing when called for on the Drawings.

Borrow - Earth materials excavated from a designated source, outside the roadway, and placed in embankments within the roadway. Designated sources for borrow material shall be shown on the Drawings or elsewhere described in the Contract Documents, and shall be approved by the Engineer prior to being place in embankment.

Pioneering - The beginning or opening of a route on which a roadway is to be constructed prior to clearing or starting any earthwork excavation.

Structure Excavation - Excavation, backfill and/or disposal of material required in the roadway for construction of culverts, bridge foundations or other structures.

Cushion - Soil materials placed over rocks or solid rock portions of the roadway to provide a gradable surface. Cushion materials shall not contain rocks large than one-third of the minimum thickness of the cushion layer.

02202.2 MATERIALS

Not used.

02202.3 CONSTRUCTION REQUIREMENTS

This Work shall consist of furnishing all labor, equipment and materials for constructing a roadway, including borrow excavation, drainage excavation, removal of slide material, excavation of unsuitable material, embankment construction and disposal of all excavated material necessary for the completion of construction.

02202.3.1 CLEARING AND GRUBBING

Clearing and grubbing shall be accomplished in accordance with Section 02015 before any excavation or embankment begins, except that grubbing of stumps when approved by the Engineer may proceed concurrently with excavation, and the removal or burning of cleared debris may be delayed until weather permits. Excavation and placement operations shall be conducted so material to be treated under Section 02015 will not be incorporated in the roadway.

02202.3.2 PIONEERING

Pioneering operations for the top of excavation slopes, toe of embankments, or pioneer road construction shall be accomplished to prevent undercutting of the final excavation slope, depositing of materials outside of the roadway limits and any restriction of drainage.

02202.3.3 UTILIZATION OF EXCAVATED MATERIALS

All suitable excavated material shall be used in the construction of embankments, subgrades, shoulders, slopes, bedding and backfill for structures and for other purposes as shown on the Drawings and as described below:

02202.3.3.1 EXCESS EXCAVATION - Designed excess excavation shall be disposed of as shown on the Drawings.

02202.3.3.2 ROCK FOR SLOPE PROTECTION - When approved by the Engineer, excavated rock suitable for protection of embankments may be conserved and used in lieu of a designated materials source.

02202.3.3.3 CONSERVING MATERIAL - Material encountered in the excavation, suitable for cushion, road finishing or other purposes, may be conserved and utilized instead of materials from designated sources.

02202.3.3.4 EXCAVATION OF UNSUITABLE MATERIAL - Unsuitable material shall be excavated. Disposal will be as shown on the Drawings. Excavated areas shall be backfilled with suitable material when necessary to complete the Work. Frozen material shall not be placed in embankments. Rocks that are too large to be incorporated into the embankment shall be broken for incorporation into the embankment or maneuvered to the face of the embankment and embedded so that they will not roll or obstruct the use and maintenance of the roadbed, or moved to locations approved by the Engineer.

02202.3.3.5 CONSERVATION OF TOPSOIL - When indicated on the Drawings, suitable topsoil shall be removed, transported, and deposited in the designated stockpile areas.

02202.3.3.6 ABANDONED STRUCTURES AND OBSTRUCTIONS - Abandoned structures and obstructions shall be treated in accordance with Section 02500.

02202.3.4 DRAINAGE EXCAVATION

Drainage excavation shall include construction of side ditches, minor channel changes, inlet and outlet ditches, furrow ditches, ditches constructed along the road but beyond the roadway limits and

other minor earth drainage structures as shown on the Drawings. Excavated material shall be utilized in accordance with subsection 02202.3.3 above.

02202.3.5 FINISHING ROADBED

02202.3.5.1 OVERSIZE MATERIALS - For roads receiving aggregate base or surface course, only rocks that do not protrude above the subgrade more than one-third of the depth of the base or surface course or 3-inches, whichever is less, may remain in place.

For unsurfaced roads, unless otherwise shown on the Drawings, the top 4-inches below the finished road surface shall not contain rocks larger than 4-inches in greatest dimension. Oversize material shall be removed, reduced to acceptable size or covered by importing suitable material approved by the Engineer.

02202.3.5.2 SHAPING AND DRESSING - The subgrade shall be visibly moist during shaping and dressing. Low sections, holes, cracks or depressions shall be brought to grade with suitable material approved by the Engineer. Final compaction of the subgrade shall meet the requirements of the embankment placing method specified.

02202.3.6 SNOW REMOVAL

Snow and/or ice shall not be incorporated into the embankment. Snow shall be removed in advance of the work to be performed and shall be deposited beyond the roadway limits in a manner that will not result in erosion or waste material.

02202.3.7 FINISHING SLOPES

02202.3.7.1 SLOPE SURFACE - Slopes shall be finished as closely as is practicable to the lines staked on the ground or shown on the Drawings. The finished slope shall be left in a slightly roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be allowed. Loose rock, loose debris and other loose material, each of which is large than 6-inches in diameter, shall be removed from the slope unless otherwise shown on the Drawings.

02202.3.7.2 SLOPE TOP - The tops of excavations, excluding areas of solid rock, shall be blended with the adjacent terrain by rounding when shown on the Drawings. Decomposed rock that may be cut without blasting or ripping shall be rounded. Earth overlying rock shall be rounded above the rock.

02202.3.8 BLASTING

02202.3.8.1 CONTROLLED BLASTING - All rock excavations that require blasting shall be formed with controlled blasting techniques unless otherwise shown on the Drawings. Controlled blasting is defined as the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes for the purpose of producing a free surface or shear plane in the rock excavation slopes and of minimizing landscape damage, adjacent ground vibration and overbreak. Presplitting is not intended unless shown on the Drawings and described in the Contract Documents.

02202.3.8.2 TEST SECTIONS - Unless directed otherwise by the Engineer, the Contractor shall drill, blast and excavate short test sections (not to yield in excess of 1,000 cubic yards) to determine the controlled blasting method, hole spacing and charge best suited to the material encountered.

02202.3.9 OVERBUILDING

Unless otherwise agreed to by the Engineer, excavation or embankment material shall be confined within the roadway limits to avoid overbuilding and to protect the adjacent property.

02202.3.10 SUBGRADE TREATMENT

02202.3.10.1 TREATMENT MATERIALS - Subgrade treatment shall consist of soil modification by mixing aggregates, placing geotextiles, fiber mat, rock blanket or other similar materials over areas of unsuitable embankment foundation material that will be indicated on the Drawings. The construction and material requirements for the subgrade treatment will be specified in the Contract Documents.

02202.3.10.2 SWAMPY GROUND - When an embankment is to be placed across swampy ground and removal of unsuitable material or subgrade treatment is not required, the lower part of the embankment may be constructed in a single layer to the minimum depth necessary to support construction equipment.

02202.3.11 EMBANKMENT PLACEMENT

All embankments shall be placed by one or more of the following methods as shown on the Drawings and listed in the Bid Schedule.

02202.3.11.1 METHOD 1 - SIDE CASTING AND END DUMPING - Embankment may be placed by side casting and end dumping. Where material containing a large amount of rock is used to construct embankments, a solid embankment shall be provided by working smaller rocks and fines in with the large rocks and fines to fill the voids.

02202.3.11.2 METHOD 2 - LAYER PLACEMENT - Surfaces steeper than a ratio of 3 horizontal to 1 vertical (3:1) upon which embankment is to be placed, shall be roughened or stepped when shown on the Drawings to provide permanent bonding of new and old materials.

- Embankment shall be layer placed, except over rock surfaces, in which case material may be placed by end-dumping to the minimum depth needed for operation of spreading equipment. Each embankment layer shall be leveled and smoothed before placement of subsequent layers. Hauling and spreading equipment shall be operated uniformly over the full width of each layer.

- Suitable material shall be placed in layers no more than 12-inches thick, except when the material contains rock more than 9-inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. No layer shall exceed 24-inches before compaction.

- Placing individual rocks or boulders greater than 24-inches will be permitted provided the embankment will accommodate them. Such rocks and boulders shall be at least 6-inches below subgrade. They shall be carefully distributed and the voids filled with finer material to form a dense and compacted mass.

- Where material containing large amounts of rock is used to construct embankments, the layers may be of sufficient thickness to accommodate the material involved. A solid embankment with adequate compaction shall be constructed by working smaller rock and fines in with the larger rocks to fill the voids and by operating hauling and spreading equipment uniformly over the full width of each layer as the embankment is constructed.

- Material shall be at a moisture content suitable to obtain a mass that will not visibly deflect under the load of the hauling and spreading equipment. Excessively wet excavated material shall be handled in accordance with Subsection 02202.3.3.1.

02202.3.11.3 METHOD 3 - LAYER PLACEMENT (ROLLER COMPACTION) - Embankments shall be placed as specified in Method 2. Placement shall be in horizontal layers not exceeding 12-inches prior to compaction, except when the material contains rock more than 9-inches in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Compaction shall be

obtained with equipment in compliance with the requirements described in the Specifications. Compaction equipment shall be operated over the full width of each layer until visible deformation of the layer ceases or, in the case of the sheepsfoot roller, the roller "walks out" of the layer. At least three complete passes will be made.

02202.3.11.4 METHOD 4 - CONTROLLED COMPACTION - Embankments shall be placed as specified in Method 2 except earth embankments shall be placed in horizontal layers not exceeding 12-inches (loose measure) and compacted. Material shall be at a moisture content suitable for attaining the required compaction. Embankments and the top 1-foot of excavation sections shall be compacted to at least 95 percent of the maximum density as determined by AASHTO T 180, Method C or D.

- The density of the embankment material shall be determined during the progress of the Work in accordance with AASHTO T 191, T 205 or T 238; T 217, T 239 or T 255; and T 224.

- Density requirements will not apply to portions of rock embankments that cannot be tested in accordance with approved methods. When this condition exists, compaction shall be provided by working smaller rocks and fines in with the larger rocks to fill the voids and by operating equipment over the embankment materials.

02202.3.12 COMPACTION EQUIPMENT

02202.3.12.1 EQUIPMENT - Compaction equipment shall be capable of obtaining compaction requirements without detrimentally affecting the compacted material. The compacting units may be any one of the types described herein, provided they are capable of compacting each lift of material as specified and meet the minimum requirements contained herein.

02202.3.12.2 ROLLER REQUIREMENT - Minimum requirements for rollers are as follows:

- Sheepsfoot, tamping or grid rollers shall be capable of exerting a force of 250 pounds per inch of width of roller drum.

- Steel-wheel rollers, other than vibratory, shall be capable of exerting a force of not less than 250 pounds per inch of width of the compression roll or rolls.

- Vibratory steel-wheel rollers shall have a minimum weight of 6 tons. The compactor shall be equipped with amplitude and frequency controls and specifically designed to compact the material on which it is used.

- Pneumatic-tire rollers shall have smooth tread tires of equal size that will provide a uniform compacting pressure for the full width of the roller and capable of exerting a ground pressure of at least 80 psi.

02202.3.13 CONSTRUCTION TOLERANCES

Unless provided otherwise herein, a specific tolerance class for allowable deviation from construction stakes and Drawings shall be shown on the Drawings. A Table of Tolerance is provided below:

TABLE OF TOLERANCES

MEASUREMENT	TOLERANCE CLASS		
	A	B	C
Roadbed Width	+0.5	+1.0	+2.0
(feet) Subgrade Elevation	±0.1	±0.2	±0.5
(feet) Centerline Alignment	±0.2	±0.5	1.0

Deviations shall be uniformly graded in the direction of change for a distance of 200-feet or more along the roadway. Roadway ditches shall always be constructed to flow in the direction shown on the Drawings, regardless of allowable deviations. Roadbed width shall be no less than the dimension shown on the Drawings or staked in the field. When a tolerance class is not otherwise indicated on the Drawings, Class B tolerance deviations will be allowed for roadway construction.

02202.3.14 WATER

Water provided for compaction, dust control, or planting and care of vegetation, shall be developed, hauled and applied in accordance with Section 02204.

02202.4 METHOD OF MEASUREMENT

02202.4.1 ROADWAY EXCAVATION

02202.4.1.1 SEPARATE MEASUREMENT - When shown as a separate item on the Bid Schedule, quantities of roadway excavation, in cubic yards, shall be determined, for undisturbed material in its original position on the ground, as measured by slope staking performed before the start of construction. Unless shown otherwise herein, measurement for roadway excavation shall include the following:

- All loosening, loading, transportation, spreading, compaction and grading required to achieve the staked grades and alignment.
- Material excavated below the required grade and beneath embankment areas when shown on the Drawings or directed by the Engineer.
- Ditches located outside of the roadway, except when they are included as an item on the Bid Schedule.
- Topsoil or other material removed and stockpiled as directed, when not measured as a separate pay item.
- Borrow material used in the Work, except when borrow is included in the Bid Schedule.
- Slide material not attributable to the negligence of the Contractor.
- The volume of materials taken from stockpiles and used in the Work, except materials included in other pay items.

02202.4.1.2 NO MEASUREMENT - Measurement for roadway excavation shall not include the following:

- Material used for other than approved purposes.
- Unauthorized excavation or borrow.
- Quantity of material excavated from slope rounding.
- Overbreakage from the backslope in rock excavation requiring blasting.
- Material scarified in place to receive the first layer of embankment.
- Benching or stepping existing ground for embankment foundation.
- Stepping or scaling cut slopes.

- Oversize material removed when finishing unsurfaced roads.

02202.4.2 ROADWAY EMBANKMENT

When shown as a separate item in the Bid Schedule, measurement of quantities for roadway embankment will be by the cubic yard as determined from slope stake information taken prior to construction, for materials in place, compacted, and accepted.. Unless shown otherwise herein, measurement shall include all loosening, loading, transportation spreading, compaction and grading required to achieve the staked grades and alignments.

02202.4.3 ROADWAY BORROW

When shown as a separate item in the Bid Schedule, quantities for roadway borrow, calculated in cubic yards, shall be measured by. comparing preliminary cross-sections of the material on the undisturbed ground to other cross sections taken following its removal. Measurement shall include all loosening, loading and transportation to the location of the embankment designated for deposit.

02202.4.4 WATER

02202.4.4.1 NO SEPARATE MEASUREMENT - Unless shown as a separate item in the Bid Schedule, no separate measurement shall be made for water required for compaction, handling or other purposes associated with earthwork excavation and embankment.

02202.4.4.2 SEPARATE MEASUREMENT - When included as a separate item, measurement will be made in accordance with Section 02204.

02202.4.5 TOPSOIL

When topsoil stripping and stockpiling is included as a separate item in the Bid Schedule, measurement will be by the cubic yard placed in stockpiles at designated locations shown on the Drawings or directed by the Engineer. Measurement shall include loading, transportation and placement into stockpiles at designated locations.

02202.4.6 TOPSOIL SPREADING

When topsoil spreading is included as a separate item in the Bid Schedule, measurement will be by the square yard of surface on which the material is spread at a depth indicated in the Drawings. Such measurement shall include loading from a stockpile or designated source, transporting and spreading to the required depth.

02202.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
Roadway Excavation (Placement Method)	Cubic Yard
Roadway Borrow (Placement Method)	Cubic Yard
Roadway Embankment (Placement Method)	Cubic Yard
Subgrade Treatment (Type)	Square Yard
Drainage Excavation (Type)	Lineal Foot
Drainage Excavation (Type)	Cubic Yard
Topsoil (Stripped & Stockpiled)	Cubic Yard
Topsoil (Spread)	Square Yard

02204.1 DESCRIPTION

Furnish and apply water for: dust control, pre-wetting, mixing or compacting earth materials for road, site, and/or trench construction, and for other needs associated with the Work.

02204.1.1 RELATED WORK

Not used.

02204.1.2 SUBMITTALS

Not used.

02204.1.3 DEFINITIONS

Not used.

02204.2 MATERIALS

Water shall be free of dirt and silt or any substances injurious to plant life. A separate supply of potable water shall be provided for drinking when it becomes necessary to provide water for workers.

02204.3 CONSTRUCTION REQUIREMENTS

Water provided for construction shall be obtained from a source approved by the Engineer and sufficient to provide for the anticipated needs of the contract.

Water hauling equipment shall have watertight tanks of known capacity and shall be equipped with a pressure pump and spray system with the capability of applying the whole load uniformly. The spray system shall have a positive shut-off control. The water tank shall have a minimum capacity of 1,000 U.S. Gallons, and the capacity shall be clearly marked on the tank. The Contractor may be required to verify the tank capacity.

A water meter may be used for water dispensing, providing its measurement can be verified.

02204.4 METHOD OF MEASUREMENT

Unless indicated otherwise in the Bid Schedule, no separate measurement will be made for water used for pre-wetting, mixing, or compaction of earth materials or for dust control.

When shown in the Bid Schedule, water shall be measured to the nearest 1/10th of 1000 gallons in calibrated tanks or tanks with approved metering devices that indicate volume in 100-gallon quantities.

02204.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAYMENT ITEM	UNIT
Water	M Gallons (1,000 US Gallons)

02206.1 DESCRIPTION

This section covers activities associated with two types of temporary road use. These are construction and use of access roads and use of existing roads which are part of the construction zone.

02206.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 01300 - Submittals
Section 02005 – Traffic Control
Section 02015 - Clearing and Grubbing
Section 02105 - Earthwork Materials
Section 02202 – Roadway Excavation and Embankment

02206.1.2 SUBMITTALS

When gravel surfacing is required, the Contractor shall submit samples and/or test data for those materials in accordance with Sections 02105 and 01300.

02206.1.3 DEFINITIONS

Access Roads – A project site access road built specifically for temporary use by project related vehicles during the construction phase of the Work. The road may be on or partially on the construction zone or only end at it.

Temporary Use of Roads – Use of an existing paved or unpaved roadway during the construction phase of a project involving degradation of the surface and/or the use of the road by the public. Temporary road use may constitute use of the roadway as all or part of the construction zone or as an immediate approach to the construction zone.

02206.2 MATERIALS

02206.2.1 ACCESS ROADS

When shown on the Drawings, surfacing material for access roads shall be Untreated Base Course (UBC) gravel which meets the requirements of Section 02105.

02206.2.2 TEMPORARY USE OF ROADS

Materials requirements for restoring and resurfacing existing roads that have been damaged or disturbed during construction will be as shown on the Plans and described elsewhere within these Specifications.

02206.3 CONSTRUCTION REQUIREMENTS

02206.3.1 ACCESS ROADS

Consists of excavating, filling, installing gravel surfacing, and other work necessary to construct minor access roads for which cut and fill quantities will not be determined.

02206.3.1.1 CLEARING - The area to be disturbed by the road construction operation shall be cleared of all trees, brush, rubbish and other objectionable matter in accordance with Section 02015 prior to beginning the trenching operation. Trees, brush, rubbish and other materials resulting from the clearing operation shall be removed and disposed of at a land fill approved by the local public authority or designated by the Engineer. Removal of these materials shall be considered as part of

the Work for access road construction and no separate measurement and payment will be made for their removal.

02206.3.1.2 UNSUITABLE MATERIAL - Material shall be considered unsuitable for fill, sub-grade, shoulders and other uses if it contains organic matter, soft spongy earth or other matter of such nature that compaction to the specified density is unobtainable.

Material that is unsuitable for the intended use shall be excavated and removed from the site to an approved disposal site or otherwise disposed of as directed by the Engineer.

02206.3.1.3 SLOPES – Slopes shall be as follows:

- Excavation slopes shall be finished in conformance with the lines and grades shown on the Drawings. Debris and loose material shall be removed.

- Tops of slopes shall be rounded as shown on the Drawings. Excavation and embankment lines shall conform to those shown on the Drawings. When completed, the road grade shall be uniform and shall provide a smooth driving surface for vehicles.

02206.3.1.4 MATERIAL AVAILABILITY - The Contractor shall utilize all suitable excavated material within the roadway. When it is determined that sufficient excavated material is not available to construct required embankment, the Engineer may designate borrow sites and, if deemed to be changed conditions, appropriate changes will be negotiated in accordance with the General Conditions.

02206.3.1.5 COMPACTION - Materials in embankments shall be placed in layers not more than 12-inches in thickness and then wheel rolled with the equipment used for placement.

Placement of surfacing shall be made in accordance with the details shown on the Drawings and then compacted by wheel rolling with equipment used for placement.

02206.3.1.6 TRAFFIC CONTROL - At all points where access roads come into contact with public thoroughfares, the Contractor shall establish and maintain adequate traffic control as described in Section 02005 and as required by the specifications of the state or local highway or road department having authority at the site.

02206.3.1.7 ENVIRONMENTAL CONTROL – During construction and use of access roads, the Contractor shall observe the requirements of Section 01520 with particular regard to dust abatement.

02206.3.2 TEMPORARY USE OF ROADS

02206.3.2.1 TRAFFIC CONTROL - At all times when the Contractor is making temporary use of public thoroughfares, the Contractor shall establish and maintain adequate traffic control as described in Section 02005 and as required by the specifications of the state or local highway or road department having authority at the site.

02206.3.2.2 PASSIBILITY – When a portion of a public thoroughfare is being utilized for construction purposes, the Contractor shall maintain as many open lanes as possible for the passage of traffic consistent with safety and good construction practice. Lanes open to traffic shall be managed and maintained free of any debris or material that might passibility and public safety.

When traffic must be limited to the use of only one lane, traffic flow shall be managed so that no undue or unreasonable delays occur. If travel on all lanes of the roadway must be interrupted for an extended period of time, the Contractor shall first prepare an adequate detour plan and have it approved by the local road or highway department.

02206.3.2.3 ENVIRONMENTAL CONTROL – While using existing roads for construction purposes, the Contractor shall observe and be responsible for the requirements of Section 01520 with particular regard to dust abatement. When sprinkling with water is being used to control dust, the Contractor shall make as many passes as are necessary, and as may be directed by the engineer, to keep the creation of dust at a minimum. While sprinkling, the Contractor shall take particular care to avoid creating slippery or otherwise hazardous conditions on any part of the roadway being used for vehicular traffic.

02206.4 METHOD OF MEASUREMENT

02206.4.1 CONSTRUCTION OF ROADS

Measurement for construction of access roads shall be made by the number of lineal feet of road excavated, compacted and graded to provide either a driveable surface or a base ready for installing gravel surfacing.

02206.4.2 GRAVEL SURFACING

Separate measurement for gravel surfacing shall be made in accordance with Section 02105 for Untreated Base Course.

02206.4.3 TEMPORARY USE OF ROADS

Restoration and resurfacing of roads disturbed or damaged during temporary use for construction shall be included with other items on the Bid Schedule and no measurement or payment for this work shall be made under this specification.

02206.5 BASIS OF PAYMENT

The accepted quantity will be paid for at the contract unit price for:

PAY ITEM	UNIT
Access Road	Lineal Foot

02208.1 DESCRIPTION

Furnish and place flowable fill for backfill in roadway trenches.

02208.1.1 MATERIALS

Cement – Use Portland Cement, Type I or II

Fly Ash – Loss on ignition must be 3% or less.

Fine Aggregate

Natural Sand
Meet the following gradation when test is specified.

Table 02208.1.1

Sieve Size	Percent Passing
No. 3/4	100
No. 100	0-10

02208.1.1 MIX DESIGN

Meet the following requirements.

Mix design compressive strength (28-day) – between 50 to 150 psi.

Portland Cement – at least 50 pounds/cubic yard

Fly Ash – at least 300 pounds/cubic yard

Slump – 6-10 inches maximum

02208.1.1 FINISH

Finish to a flat surface.

02222.1 DESCRIPTION

This section covers furnishing and installation of pipe and fittings of the type, class and size designated for the water system defined on the Drawings, in these Specifications, and elsewhere in the Contract Documents.

02222.1.1 RELATED WORK

Section 02105 - Earthwork Materials
Section 02200 - Trench Excavation and Backfill
Section 15110 - Pipe and Piping Systems
Section 15230 - Waterline Valves and Hydrants
Section 15232 - Water System Control Valves
Section 15234 - Water Service Connections
Section 15236 - Water Main Flow Meters

02222.1.2 SUBMITTALS

02222.1.2.1 MATERIALS AND EQUIPMENT - The Contractor shall submit for review complete information, showing all pipe, materials, fittings, gaskets, couplings, coatings, linings, supports, mechanical restraints, thrust blocks and configuration prior to the delivery of any components to the project. All information shall be provided in accordance with Section 01300 and written evidence of compliance from the manufacturer shall be provided with each delivery of material.

02222.1.2.2 TESTING - As construction proceeds, the Contractor shall submit test documentation in accordance with this section of these Specifications.

02222.1.3 DEFINITIONS

Fitting - Any component of a pipeline, excluding the pipe itself and valves and meters, which is used for connecting pipe sections; changing line direction or size; connecting meters, valves, tanks, etc.; or starting or terminating pipelines.

Mains - Water distribution pipes, located in streets or rights-of-ways, to which water service connections are made for users of the system.

Run - Any identified section of a pipeline.

Saddle - A fitting placed on a pipe to reinforce the pipe wall, through which a tapping hole is drilled.

Service Lateral – The line which connects to the water meter or to the service stub at the property line extending from there, on private property, to the plumbing at the foundation of a house or business.

Service Stub – The line running from the tap on a main to the meter or to the property line as appropriate.

Tap - The actual connection made to water mains which includes drilling an opening into the main, threading, installing a tapping saddle when appropriate, and installing a valve into the opening.

02222.2 MATERIALS

02222.2.1 PIPE AND FITTINGS

See Section 15110

02222.2.2 PIPELINE LOCATION IDENTIFIERS

Pipeline location identifiers generally take the form of marker posts, warning tape, and tracer wire.

02222.2.2.1 TRACER WIRE - Unless otherwise described on the plans or herein, the tracer wire shall be an insulated, #12, direct bury copper wire designed and manufactured for this purpose.

02222.2.2.2 WARNING TAPE - The warning tape shall be an inert, plastic, direct bury type with a 2-inch minimum width, of the appropriate safety color, and specifically manufactured for underground utility identification. The tape shall have wording imprinted on it identifying the type of utility it is protecting.

02222.2.2.3 MARKING POSTS - Shall be fiberglass compound, aluminum, or other corrosion resistant metal of 5 foot length and 4 inches wide, or otherwise as shown on the Drawings. They shall be fitted with a deterioration resistant warning notice or label appropriate to the application.

02222.2.3 MISCELLANEOUS FITTINGS AND MATERIALS

02222.2.3.1 POLYETHYLENE ENCASEMENT - Where soil conditions are determined to be severely corrosive and when shown on the Drawings or required in the Contract Documents, tubular polyethylene encasement shall be installed around buried ductile iron piping and fittings in accordance with ANSI/AWWA C-105.

02222.2.3.2 CASING PIPE - Where casing pipe is called for on the Drawings or is required by the Engineer, the Contractor shall furnish and install the casing in accordance with Sections 02315 and 02320 of these specifications.

02222.2.3.3 PIPE PENETRATION OR CASING SEALS - Where required on the Drawings or in these Specifications, the Contractor shall furnish and install pipe-to-wall linked rubber seals in core drilled structures, walls, pipe sleeves, or casings in accordance with the manufacturer's instructions. Seals shall be link seals by Thunderline Corporation, or an approved equal.

02222.2.3.4 PIPE RESTRAINTS – Pipe restraints shall be as follows:

- Concrete thrust blocking shall be formed, sized, and placed as described herein and shown on the Drawings. Reinforcing bars used in thrust block construction shall be preformed and fusion bonded epoxy coated.

- Mechanical restraint of piping shall be accomplished with one of the following restraining systems or an approved equal:

  ⇒ Grooved Ductile Iron AWWA Couplings by Victaulic Company of America (use only with exposed piping systems).

  ⇒ MEGALUG thrust restraints by EBAA Iron Sales, Inc.

  ⇒ FIELDLOK restraint gaskets by U.S. Pipe Company. Without the written approval of the Engineer, use of this restraint device is limited to joints in carrier pipe installed in a casing pipe.

All joints of pipe installed under streambeds or canal crossings, or installed in casing pipes, shall be protected with mechanical restraint.

Restraint protection of above ground or exposed piping in buildings or enclosures shall be accomplished only with mechanical restraints.

02222.3 CONSTRUCTION REQUIREMENTS

02222.3.1 HANDLING AND APPROVAL OR REJECTION OF MATERIALS

All materials delivered to and used at the job site are subject to approval of the Engineer or the Owner. Care shall be taken during handling of pipe, to avoid any impact which might cause damage. Dropping pipe during unloading will not be permitted. Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe before or after laying, it shall be removed and replaced by the Contractor, at no additional cost to the Owner. Any pipe found to be unfit or rejected due to cracks, broken bells or spigots, irreparable chipped lining, etc., shall be removed from the job site.

02222.3.2 DIAGRAMMATIC LAYOUT

Piping layout on the Drawings shall be considered diagrammatic for all piping not shown with detailed dimensions. When this is the case, pipe size and location are provided, but the Drawings are not intended to show every offset, fitting, or structural difficulty that will be encountered during project construction.

02222.3.3 ALTERATION OF ALIGNMENT

At no additional cost to the Owner, and with written permission from the Engineer, piping alignment may be varied from that shown on the Drawings, to avoid structural or mechanical difficulties, or to avoid the work of other trades. The Contractor still will be liable to provide all materials and labor required to complete all work in accordance with the best practice of the trade, and to the satisfaction of the Engineer.

02222.3.4 INSTALLATION

02222.3.4.1 DEWATERING - Prior to pipe laying and jointing, sufficient dewatering effort shall be provided to maintain the ground water level at or below the surface of the trench bottom or base of the bedding course. The dewatering operation; however accomplished, shall be carried out in such a manner as to not permanently disturb natural underground water conditions.

02222.3.4.2 CONNECTION TO EXISTING FACILITIES - When connections are to be made to any existing pipe or appurtenances, for which the actual elevation or position cannot be determined without excavation, the Contractor shall excavate for, and expose the existing pipe or appurtenances before laying any new pipe. The Engineer shall be allowed to inspect the existing pipe or appurtenances before any connection is made. The Contractor shall make any adjustments in line or grade which may be necessary to accomplish the intent shown on the Drawings.

Where new fittings, valves, meters, restraints etc., are required to be installed in, or attached to, existing piping, or where connections are to be made to existing piping, the Contractor shall furnish and install the necessary components needed to accomplish the work, whether or not specifically indicated on the Drawings.

02222.3.4.3 CAPPING PIPE END - At the close of each workday, or whenever the work ceases for any reason, the end of the pipe shall be securely closed, unless otherwise permitted by the Engineer.

02222.3.4.4 JOINING – Joining of pipe shall be as follows:

- When making connections, pipe shall be cut and beveled in a neat and workmanlike manner, so as to provide a smooth, beveled end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Flanges, unions, flexible couplings and other connections shall come together at the proper orientation. The fit shall not be made by springing any piping, nor shall orientation or alignment be corrected by taking up on any flange bolts. Flange bolts, union halves, flexible connectors, etc., shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to fit.

- PVC pipe, 2 inches and smaller in diameter, shall be joined by solvent welding. No disturbance of joints, including from trench backfill operations, will be allowed until solvent welded joints are cured.

- PVC pipe, larger than 2 inches in diameter, shall be joined by means of gasketed joints.

- With bell and spigot joints, care should be taken to properly align the pipe before joints are forced home. Gaskets shall be lubricated in accordance with manufacturer's instructions. During insertion of the spigot end, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

- Where fusion of polyethylene pipe joints is required, sections of pipe shall be joined in a continuous length on the job site above ground. Joining shall be by the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Equipment used for butt fusion joining shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures.

02222.3.4.5 LAYING - All pipe laid shall be retained in position, using mechanical means if necessary, so as to maintain alignment and joint closure until sufficient pipe bedding and backfill have been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within specified limits. No blocking of any kind shall be used to adjust the pipe to grade, except when used with concrete embedment. Bedding materials shall be placed so the bottom surface of the pipe will have full bearing for the entire barrel length. The pipe shall rest on not less than 1/4 of its outside perimeter. Bell holes shall be dug as required to assure uniform support along the barrel but shall be no larger than necessary.

Unless otherwise approved by the Engineer, pipe shall be laid upgrade from the point of connection on the existing pipeline or from a designated starting point. Pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress, the forward end of the pipe shall be kept closed with an approved temporary plug.

02222.3.4.6 PIPE RESTRAINT – Pipe restraint work shall be as follows:

- The Contractor shall provide and install either concrete thrust blocks or mechanical pipe restraints on all pressure piping not connected with bolted flanges or welded joints.
- For projects involving pipeline construction covered under this section of the Specifications, a pipe restraint schedule is included in the Drawings. Pipe restraints (thrust blocks and/or mechanical restraints) shall be furnished and/or constructed and installed as shown on the Drawings and described in the schedule.
- Pressure pipe shall be properly blocked or restrained at all fittings, wherever the pipeline makes a change in direction of 11.25 degrees or more, wherever it changes sizes, or wherever it ends.
- Placement of concrete thrust blocking shall provide bearing against undisturbed vertical earth banks or approved compacted backfill, sufficient to absorb thrust from line pressure, and in a configuration so that pipe joints and fittings will be accessible.
- All restraints shall be in place before any hydrostatic testing and flushing are performed on the system.
- The Contractor shall allow visual inspection of every thrust block or mechanical restraint before it is buried.

02222.3.4.7 FINISH BEDDING - After the pipe is laid, additional bedding material shall be placed in 6-inch lifts to a level even with the spring line of the pipe and compacted. The portion of the trench from the spring line to 12 inches above the top of the pipe shall then be filled and compacted in the same way.

02222.3.4.8 REQUIREMENTS FOR INSTALLATION NEAR SEWER LINES - Locate potable water piping at least 10 feet horizontally (measured edge to edge) from any existing or proposed parallel sewer or wastewater leach line. Should conditions prevent the 10-foot separation, the water line may be laid closer than 10 feet to sewer lines (but not leach lines) provided:

- The water line is laid 18 inches above the top of the sewer line, but deep enough to prevent freezing, and
- The water line is laid in a separate trench, or
- The water line is laid on an undisturbed earth shelf on one side of the sewer line trench, or
- The water line is laid in a sewer or drain line trench, which has been backfilled and compacted to not less than 95% of maximum density, as determined by ASTM D-690.

Where potable water lines cross sewer lines, the bottom of the water line shall be at least 18 inches above the top of the sewer line for ten feet on each side of the sewer line, measuring perpendicularly from the water line to the sewer line. When such vertical separation is impossible to achieve, a vertical separation of less than 18 inches may be allowed provided:

- In new construction for both water line and sewer line they shall be constructed of ductile iron pipe or thermoplastic pipe joined by either mechanical or bolted flange joints. Thermoplastic pipe may also use solvent welded joints. In situations with an existing sewer line, the new water line shall be constructed as previously described.

- And, when making such crossing, install the water line in such manner that the center of a full length of pipe is on the centerline of the sewer line to isolate the water line joints as far as possible from the sewer line.

02222.3.4.9 EXPOSED PIPING - No exposed piping shall be installed until all equipment to which the pipe is to be attached has been installed and it can be determined where piping and fittings shall be located to make a neat, efficient arrangement. Piping shall be aligned with equipment connections such that no external load or stress will be transferred to any equipment from the piping. Piping shall be installed with a sufficient number of unions, flexible couplings, or flanged joints, in addition to those shown on the Drawings, to allow for convenient inspection and maintenance.

Exposed pipe work shall be suspended or supported, to prevent sagging or over-stressing of the pipe and connections. Assembly of pipe and fittings shall be accomplished so there will be no distortion or springing of the pipe. The fit shall not be made nor the alignment corrected by taking up on any flange bolts. Joints shall come together in proper orientation, and Flange bolts, union halves, flexible couplings, and etc. shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to make the fit meeting the above requirements.

Exposed pipe shall be installed in straight runs parallel to the axis of the structures. Pipe runs shall be horizontal and vertical; except that gravity drain lines shall be pitched down in the direction of flow at a slope not less than 1/8 inch per foot.

All exposed pipe shall be painted in accordance with Section 09910 of these Specifications. Factory finished items are not required to be field painted except touch-up. The color and type of paint used shall be submitted to the Engineer for his approval.

02222.3.4.10 DRAINS AND OTHER SYSTEMS - In addition to other requirements in this Section, all irrigation and other lines fitted with drains shall be installed such that continuous slope is maintained to designated drain locations. In areas where there are both culinary water pipelines and irrigation pipelines, exposed portions of irrigation water piping shall be identified by distinctive coloring or other marking. Culinary and irrigation lines and extensions shall be completely separated, installed in separate trenches, and there shall be no cross-connection between the systems under any circumstances.

02222.3.5 SPECIAL CONSIDERATIONS FOR HDPE PIPE

02222.3.5.1 HANDLING AND STORAGE – Polyethylene pipe is able to withstand normal installation handling. However, unusually rough handling of polyethylene pipe can result in damage to the pipe wall. Care shall be taken to avoid pushing or pulling polyethylene pipe over or around sharp projections. Polyethylene pipe is subject to impact damage when dropped from excessive heights or when heavy objects are dropped upon it, particularly during cold weather. Kinking or buckling shall be avoided and any section of pipe which has been damaged in this manner shall be cut out and replaced. If a scratch depth is greater than 10% of the pipe wall thickness, then the section shall be removed and replaced.

02222.3.5.2 FUSION JOINT INSPECTION – The field technique for evaluating a butt fusion joint is bead appearance. The recommended procedures should result in the desired appearance. The Contractor shall inspect the entire circumference of the fused joint for uniform non-porous bead alignment. Improper fusion shall be redone. The Contractor shall comply with the Butt Fusion Joint Appearance Guide recommended by the manufacturer.

02222.3.5.3 PIPE PLACEMENT – Polyethylene pipe can be joined either above ground or in the ditch as the situation dictates. Though most joining can be accomplished above ground, joining which must be done in the ditch shall be well planned to ensure that enough space is available and that proper alignment is achieved. Care shall be taken to avoid buckling, gouging, and other mechanical

damage when lowering polyethylene pipe into the ditch. The pipe should be laid so that there are no bends with a radius less than 20 times the pipe diameter and no joints within 3 feet of any bends. (90 times the pipe diameter at fusions.)

- Align all pipe and fitting joints true to line and grade. Extremely cold weather makes polyethylene pipe stiffer and increases the likelihood of impact damage.

- Because plastic pipe contracts as it cools, it is desirable in hot weather to snake the pipe in the bottom of the trench. This provides for "slack" in the pipeline to be taken up as the pipe cools and contracts in the ditch prior to backfilling. It is recommended that backfilling be accomplished after the pipe has cooled in the shade of the trench.

02222.3.5.4 HYDROSTATIC LEAK TESTING – Hydrostatic testing of the HDPE pipeline shall be performed on as complete of sections of the installed pipeline as possible and in the presence of the Engineer. Hydrostatic testing procedures shall be as described by "DriscoPlex" Bulletin: PP 802-TN, Test Phase Alternate #1 (www.driscoplex.com). Under no conditions except with the written consent of the Engineer shall pneumatic testing be allowed. Pressure recordings and other testing data shall be kept by the Contractor and supplied to the Engineer upon successful completion of the testing procedures.

02222.3.6 FLUSHING AND CLEANING

02222.3.6.1 FLUSHING WITH WATER - Prior to proceeding with pressure testing (and/or disinfection if required) of completed lines, the Contractor shall fill the test section with clean, potable water and flush the lines. The Contractor shall furnish all equipment and labor to complete the flushing as required by this section. Water for flushing shall be provided by the Owner.

02222.3.6.2 DIFFICULT CONTAMINANTS - Certain contaminants, especially in caked deposits, resist flushing at any velocity. If, in the opinion of the Engineer, such contaminants have entered the line during construction, the interior of the pipe shall be swabbed, as necessary, to remove the debris prior to proceeding with flushing.

02222.3.6.3 MINIMUM FLUSHING FLOW AND VELOCITY - The Contractor shall make all arrangements, to establish a minimum 2.5 feet per second (fps) flow velocity in the line during the flush. Flushing shall proceed until the installed pipe is free of debris. The flows needed to produce the required flushing velocity indicated above are provided in the table below.

FLUSHING FLOW AND VELOCITY

Pipe Diameter (inches)	Flow (gpm) to Produce 2.5 fps
4	100
6	200
8	400
10	600
12	900
16	1600

NOTE: With 40 psi residual pressure, 2 1/2 inch and 4-1/2 inch hydrant outlet nozzles will have the ability to discharge approximately 1,000 GPM and 2,500 GPM respectively.

02222.3.7 TESTING

The Contractor shall perform all testing, and shall furnish all materials, equipment, and labor necessary to complete this work as required. Any work that fails to meet the acceptance criteria of prescribed testing shall be repaired and/or replaced at no additional cost to the owner. All repaired work shall be re-tested. This sequence shall be repeated until the work meets the acceptance criteria.

02222.3.7.1 PRESSURE TESTING - All pipelines constructed for carrying potable, non-potable, and water-borne products shall be pressure tested for leakage when they are completely assembled, unless directed otherwise in these Specifications or in writing by the Engineer.

WARNING - The hydrostatic test procedures described herein are not applicable to air pressure testing.

Prior to pressurization all required flushing shall have been completed. Pipeline sections to be tested shall be isolated from any connecting lines. Air release taps shall be provided at points of highest elevation, the test section shall be filled with clean potable water, and all air shall be removed from the line. Pressure on the test section shall then be brought to full test pressure and maintained at that level for a period of not less than 4 hours. Pipelines shall be tested at 50 psi over normal static pressures shown on the Drawings or to the manufacturer's class rating, which ever is lower. Permanent plugs shall be inserted into the air release tap holes after the test has been completed.

02222.3.7.2 LEAKAGE TESTING - The leakage test shall be conducted concurrent with the pressure test. Amount of leakage, if any, will be determined by measuring the quantity of additional water required to maintain the prescribed hydrostatic pressure test during the test period. Accurate means shall be provided to measure the quantity of water required to maintain full pressure on the line for the 4 hour test period, the measured leak rate shall not exceed the rate "L" computed as follows:

$$L = SD(P^{0.5})/133{,}200$$

where:
L = Leakage rate (gal/hour)
S = Length of tested pipe (feet)
D = Nominal diameter of pipe (inches)
P = Average test pressure (psi)

When the allowed amount of leakage is exceeded, leaks shall be located and repaired and the system shall then be re-tested by the Contractor until compliance is achieved.

All visible leaks in exposed pipe shall be repaired.

02222.3.7.3 OPERATIONAL TESTING (*pressurized irrigation only*) - Pressurized irrigation systems shall be tested for proper system operation after backfill is in place and sprinkler heads have been adjusted to final position. This test shall demonstrate that the system meets coverage requirements (based on operation of one circuit at a time) and that all automatic controls function properly.

02222.3.7.4 NON-RIGID PIPE DEFLECTION TESTING - At the Engineer's request, the Contractor shall test requested portions of all non-rigid pipe after being installed and backfilled to ensure that circumferential deflection does not exceed 5% of the diameter. Such test will consist of passing a mandrel through an open section of pipe, sized appropriately to detect non-compliance. The mandrel shall be sized in accordance with the requirements provided in Section 02224 for checking sewer pipe. In the event deflection non-compliance is found, the Contractor shall make repairs as outlined in Section 02224 and additional testing of other sections of pipe will be requested.

02222.3.7.5 TESTING DOCUMENTATION - The Contractor shall maintain a record of all testing performed, together with the test results obtained, for each line installed under this Contract. Minimum information to be included in these records shall be as follows:

- All Documents:
  - Date of issuance of the record
  - Name of Contract
  - Contractor's name and address

- Disinfection Report:
  - Name and address of treatment supervisor
  - Disinfection method used
  - Location and boundary description of section to be disinfected
  - Time and date of disinfectant introduction
  - Time and date of disinfectant release
  - Initial disinfectant residual (PPM) for each outlet tested
  - Time and date of flushing after disinfection
  - Signature of treatment supervisor (signifies completion of disinfection activities)

- Bacteriological Report:
  - Date issued
  - Project name and location
  - Laboratory's name, certification number, address and phone number
  - Test location
  - Time and date of sample collection
  - Name of person collecting sample
  - Time and date of laboratory test start
  - Coliform bacteria test results for each sample
  - Certification that water conforms (or fails to conform) to bacterial standards of the appropriate state public drinking water regulations
  - Bacteriologist's signature

- Test Report:
  - Type of test
  - Location of test
  - Sizes, types, and lengths of pipe in test section, and test boundary description
  - Date and Time test started
  - Date and Time test completed
  - Test pressure (*Pressure Test only*)
  - Amount of leakage/allowable leakage (*Pressure Test only*)
  - Mandrel dimensions(*Obstruction and Non-Rigid Pipe Deflection Tests only*)
  - Test result (*pass/fail*) (*All Tests*)
  - Printed Name/Signature and Date of Test Supervisor (Contractor's representative) (*All Tests*)
  - Printed Name/Signature of Inspector (Engineer's representative) witnessing and approving the test (*All Tests*)

02222.3.8 DISINFECTION

02222.3.8.1 REGULATORY COMPLIANCE - All pipelines to be used for culinary water service shall be disinfected in accordance with the requirements of state and local public drinking water regulations.

02222.3.8.2 METHODS - The Contractor may use any method which complies with the above referenced standards; however, the "slug method", prescribed in ANSI/AWWA C-651, is preferred. This method basically consists of filling the line with potable water and then injecting a "slug" of concentrated chlorine solution (100 mg/L) at the upstream end of the line. The "slug" is then moved through the line by slowly draining the low end. When properly conducted, this procedure provides contact to the interior pipe surfaces with a heavily concentrated dose of chlorine to achieve disinfection.

02222.3.8.3 FLUSHING - After disinfection, the lines shall be flushed until residual chlorine is reduced to the levels safe for consumption. Samples for bacteriological testing can then be taken. The Contractor shall safely and legally dispose of contaminated water used for disinfection after consultation with the local authorities. Under no circumstances shall heavily chlorinated water be allowed to mix with "live" waters, meaning waters in lakes, rivers, streams or wetlands.

02222.3.9 PIPELINE LOCATION IDENTIFIERS

The Contractor shall furnish and install such identifiers as shown on the Drawings and/or prescribed in these Specifications.

02222.3.9.1 TRACER WIRE – Tracer wire shall always be installed in the trench with non-metallic pipelines, during or immediately following their installation and may be required in the installation of metallic pipelines where electric conductance is necessary and is not provided through the pipeline because of its type of construction. Tracer wire placement shall be as shown on the Plans but shall generally be immediately beneath (preferred), to the side, or above the pipeline with approximately 4 inches of separation. Tracer wire shall be brought to the surface of the ground at all valves and risers and where otherwise shown on the plans.

Tracer wire shall be installed as shown in the Plan details. Where splices in the wire are required, the Contractor shall solder the wire connections. Tee splices shall be made with a minimum of 4 turns wrapped tightly around the bared portion of the main tracer. Do not cut main tracer wire. Line splices shall be made by crossing the two bare sections of wire with a minimum of 4 turns in opposite directions as shown in splice detail. Solder and finish connection using a no. 1 welding tip with a soft non-carbonizing flame or a propane torch, using rosin flux and 60/40 rosin core solder. Do not use acid core solder under any circumstances. Use only enough heat to insure a smooth solder joint. Heat should be applied to the wire, not to the solder. Heat the connection for a few seconds and touch the end of the solder to the joint; when the proper temperature is achieved, the solder will melt and flow freely around the connection. Allow the wire to cool and do not move while cooling. Insulate by applying several turns of 3 m 88 or approved equal electrical tape around the soldered joint. Extend the tape well over the wire insulation in all directions.

Some soil conditions and/or installation circumstances may require the additional installation of cathodic protection for the tracer wire. When this is the case, cathodic protection will appear as a separate bid item and details for its installation will appear on the Plans and elsewhere in these Specifications.

02222.3.9.2 WARNING TAPE – A continuous ribbon of warning tape shall be installed during the backfill operation. Tape shall be placed 12-inches above the top of the pipeline or otherwise as shown on the drawings. At roll ends and at places where the tape has been broken, the loose ends shall be tied together to prevent separation during the rest of backfill.

02222.3.9.3 MARKING POSTS – Marking posts shall be installed at the placement intervals shown on the Plans. Posts shall not be deformed or damaged during installation. The Contractor shall use a post hole digger to install markers when there is danger of damage to posts from pounding or hammering

02222.3.10 CLEANUP

Following acceptance of testing and completion of backfilling and surface restoration, the Contractor shall prepare the work for contract closeout in accordance with Section 01200 of these Specifications.

02222.4 METHOD OF MEASUREMENT

02222.4.1 BURIED WATER LINES

The amount of buried water line pipe shall be determined by measuring the lineal feet of pipe in place and accepted, including the lengths of fittings, valves, couplings, and portions of pipe within casings, unless called out otherwise in the Contract Documents.

Measurement of lines passing through, or connecting to control valves or other operating devices enclosed in vaults or manholes, shall be made only up to the pay limit of the enclosure or vault as shown on the Drawings. If no pay limit is shown, measurement will be made to a point five (5) feet outside of the enclosure.

Measurement of ductile iron pipe shall include polyethylene encasement where that material is required.

02222.4.2 PIPELINE LOCATION IDENTIFIERS

Measurement of tracer wire and location markers installed with non-metallic pipe shall be included in the measurement of the waterline pipe unless they are separate bid items in which case measurement for tracer wire shall be the same as the length of waterline installed and location markers shall be measured by counting the number of markers installed.

02222.4.3 EXPOSED PIPELINES

Exposed water pipe shall not be measured in connection with the installation of water lines but shall be included in the measurement of the structure or facility where the exposed pipe is located, and payment for such pipe shall be included in the payment for those bid items.

02222.4.4 FITTINGS

Unless specifically called out for separate payment on the Bid Schedule, fittings for pipelines and piping systems will be considered appurtenant to the line or system being installed, and measurement for such fittings will be included in the measurement for that pipeline or piping system.

02222.4.5 MISCELLANEOUS

Separate measurement for valves and vaults and enclosures and their contents will be as described in other sections of these Specifications.

02222.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
PVC Pipe (*Class*) [AWWA C-900] or [*Pressure rated*] (*size*)	Lineal Foot
DI Pipe (*Class*) (*size*)	Lineal Foot
HDPE Pipe [IPS] or [DIPS] C906 SDR (#) (size)	Lineal Foot
Galvanized Iron Pipe (*Schedule*) (*size*)	Lineal Foot
Pipeline Location Markers	Each

No separate payment will be made for fittings unless called for on the Bid Schedule.

02224.1 DESCRIPTION

Includes furnishing and installation of pipe, fittings and manholes and their appurtenances for sanitary and storm sewers and subsurface drainage systems.

02224.1.1 RELATED WORK

Section 02105 - Earthwork Materials
Section 02200 - Trench Excavation and Backfill
Section 03500 - Pre-Cast Concrete Components
Section 15110 - Pipe and Piping Systems

02224.1.2 DEFINITIONS

Culvert - A section of pipe installed transversely under a road, highway, railroad, or canal for the purpose of conveying water flow.

Fitting - Any component of a pipeline, excluding the pipe itself, which is used for connecting pipe sections or connecting to valves, tanks, structures, etc.

Flowline - A line formed by the inverts of a pipeline.

Infiltration - Any uncontrolled seepage of groundwater into a sewer line or system.

Inflow - Any water entering a sewer.

Invert - The bottom or lowest point of the internal surface of a cross-section of a pipeline.

Lateral - Any line which connects to, and extends from, a sewer main line. A Service Lateral is any line which connects to a sewer service stub at the property line and extends on private property to the sewer plumbing at the foundation of a house or business.

Permeability - The property of a material which describes the rate of movement of any fluid through the pores of the material.

Resilient Connector - A flexible (rubber, plastic, etc.) connection fitting manufactured specifically for joining one pipe to another or to a structure, and capable of being deflected or deformed without leakage.

Run - Any identified section of a pipeline.

Service Stub - The line which connects to a sewer main line at the service tap and extends from there to the property line.

Service Taps - Connections to sewer main collection lines from individual services.

Springline - The points of maximum horizontal distance on the inside surface of a circular pipe or in rectangular pipe; the mid height of the internal vertical walls.

02224.1.3 SUBMITTALS

The Contractor shall submit for review, complete information for pipe, fittings, gaskets, manholes, prefabricated boxes and entry covers which clearly describes those materials and their finishes and interior coatings. This information shall be furnished to the Engineer before delivery orders for materials are placed with the respective suppliers.

All information shall be provided in accordance with Section 01300 and written evidence of compliance shall be provided with each delivery of material.

02224.2 MATERIALS

02224.2.1 PIPE

See Section 15110 for pipe materials specifications.

02224.2.2 MANHOLES AND ENCLOSURES

02224.2.2.1 MANHOLES - Manholes consist of the base, riser, cone, grade rings, rings and covers. Manholes shall be constructed of pre-cast, reinforced concrete and shall conform to the Drawings, to Section 03500 of these Specifications, and to ASTM Standard C478. Unless shown otherwise on the Drawings, the wall thickness of 48-inch and 60 inch manholes shall be minimum 5-inches and 6-inches respectively. Cone sections shall be eccentric and be designed to meet AASHTO HS-20 loading requirements. Pipe connections and/or knockouts shall be sized and located according to the Drawings. Grade rings shall have 4-inches minimum vertical thickness.

02224.2.2.2 JOINTS - All manhole components shall be joined with tongue and groove joints and joints shall be sealed so that they are watertight. Sealant materials shall be flexible butyl resin sealant which conforms to AASHTO M-198B, or a rubber gasket may be used if it is specifically designed for installation in concrete manholes and conforms to ASTM C-361.

02224.2.2.3 RINGS AND COVERS - Manhole rings and covers shall be cast iron, be H-20 loading rated, be manufactured to fit the concrete openings of the manhole and shall meet the requirements of ASTM A48, Class 30B. The clear opening of the ring shall be 24-inches minimum. Vented covers, without dustpans, shall be provided for all manholes located where drainage or flooding will not occur. Watertight covers shall be provided wherever the manhole may be flooded with street runoff or floodwater. Combined weight of the ring and cover shall be not less than 360-pounds. All covers shall have cast into the upper surface the word "SEWER" and other lettering and insignias as may be shown on the plans.

02224.2.2.4 STEPS - Plastic or fiberglass steps reinforced with steel, which conform to ASTM C487 or ASTM C478 standards, shall be installed in all sections of each manhole as shown on the Drawings.

02224.2.2.5 CONNECTIONS - All connections to the manhole with piping shall be made with flexible positive seal, watertight gaskets or boots manufactured by Forsheda NPC, Inc., or an approved equal which meets the requirements of ASTM C923.

02224.2.3 PIPELINE LOCATION IDENTIFIERS

Pipeline location identifiers generally take the form of marker posts, warning tape, and tracer wire. The Contractor shall furnish and install such identifiers as shown on the Drawings and prescribed in these Specifications.

02224.3 CONSTRUCTION REQUIREMENTS

02224.3.1 HANDLING AND APPROVAL OR REJECTION OF MATERIALS

Care shall be taken during unloading and hauling to avoid impact which might damage the pipe. Pipe dropped during unloading shall not be installed unless approved by the Engineer and may be rejected by the Engineer. Pipe will be carefully inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be removed and replaced by the

Contractor at no additional cost to the Owner. Any pipe which is found to be unfit or is rejected due to cracks, broken bells or spigots, chipped exterior or lining, etc., shall be removed from the job site.

02224.3.2 TRENCHING

Excavation and backfill of trenches for sewer piping and manholes shall be performed in accordance with Section 02200 – "Trench Excavation and Backfill" of these Specifications.

02224.3.3 PIPE INSTALLATION

02224.3.3.1 DEWATERING - Prior to pipe laying and jointing, when water is present in the trench, sufficient de-watering effort shall be made to maintain the water level at or below the surface of the trench bottom or the base of the bedding course. The de-watering operation; however accomplished, shall be carried out in such a manner as not to permanently disturb natural groundwater conditions.

02224.3.3.2 CONNECTION TO EXISTING WORK - When connections are to be made to any existing pipe, conduit, or other appurtenance for which the actual elevation or position cannot be determined without excavation, the Contractor shall excavate for, and expose the existing pipe conduit, etc., before laying any new pipe or conduit. The Contractor shall furnish and install the necessary couplings, fittings, etc., needed to accomplish the cutting in, or connections, whether or not specifically indicated on the Drawings.

The Engineer shall be allowed to inspect the existing pipe or conduit before any connection is made. The Engineer may then make adjustments as required in the line and grade to accomplish the intent shown on the Drawings.

02224.3.3.3 PIPE JOINING – Pipe joining shall be as follows:

- When making connections, pipe shall be cut in a neat and workmanlike manner and beveled so as to provide a smooth end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Care must be taken to properly align the pipe before joints are forced home.

- Where fusion of polyethylene pipe joints is required, sections of pipe shall be joined in a continuous length on the job site above ground. Joining shall be by the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Equipment used for butt fusion joining shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment, and fusion pressures.

- PVC pipe, 2 inches and smaller in diameter, shall be joined by solvent welding. No disturbance of joints, including from trench backfill operations, will be allowed until solvent welded joints are cured.

- PVC pipe, larger than 2 inches in diameter, shall be joined by means of gasketed joints.

- With bell and spigot joints, care should be taken to properly align the pipe before joints are forced home. Gaskets shall be lubricated in accordance with manufacturer's instructions. During insertion of the spigot end, the pipe shall be partially supported by hand, sling, or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned. Since the most flexible gasketed joints tend to creep apart when the end pipe is deflected and straightened, such movement shall be held to a minimum once the joint is home.

02224.3.3.4 PIPE LAYING - All pipe shall be laid to conform to the prescribed line and grade shown on the plans, within specified limits, if any. No blocking of any kind shall be used to adjust the pipe to grade, except when used with concrete embedment. Unless otherwise approved by the Engineer, pipe shall be laid upgrade from the point of connection on the existing pipeline or from a designated starting point. The pipe shall be installed with the bell end forward or upgrade, unless approved otherwise.

The Contractor shall install gravity sewer pipelines at the proper slope by the use of a laser targeting system. Lasers shall be set at the proper slope in manholes and targets shall be affixed at the end of pipe sections being installed. As an alternative to targets, the laser beam may be set at the sewer invert, slope, and elevation. The inside bottom surface of the pipeline will be set directly next to the laser beam. Gravity sewer pipeline alignment shall be a straight line, both vertically and horizontally, between manholes.

All pipe laid shall be retained in position, by mechanical means if necessary, so as to maintain alignment and joint closure until sufficient pipe bedding and backfill have been installed to adequately hold the pipe in place.

0224.3.3.5 PIPE BEDDING - Bedding materials shall be placed so the bottom surface of the pipe will have full bearing for the entire barrel length. The pipe shall rest on not less than 1/4 of its outside perimeter. Bell holes shall be dug as required to assure uniform support along the barrel, but shall be no larger than necessary. After the pipe is laid, additional bedding material shall be placed and compacted in 6-inch lifts to a level even with the spring line of the pipe. The portion of the trench from the spring line to 12 inches above the top of the pipe shall then be filled and compacted in the same way.

02224.3.3.6 COVERING PIPE END - At the close of each workday, or whenever the work ceases for any reason, the end of the pipe shall be securely covered or plugged, unless otherwise permitted by the Engineer.

02224.3.3.7 CONSTRUCTION NEAR CULINARY WATER LINES - Locate sewer lines at least 10 feet horizontally from any existing or proposed parallel culinary water line. When installation conditions prevent the 10-foot separation, the sewer and water lines may be laid closer, provided

- The elevation of the bottom of the water line is at least 18-inches above the top of the sewer pipe, and
- The water line is laid in a separate trench, or
- The waterline is laid on an undisturbed earth shelf on one side of the sewer line trench, or
- The waterline is laid in a sewer or drainline trench which has been backfilled and compacted to not less than 95% of maximum density determined by ASTM D-690.
- Where culinary water lines and sewer lines cross, either above or below the other, the lines shall be placed:
    - ♦ So as to provide a minimum separation of 18-inches between the top of one line and the bottom of the other;
    - ♦ So that the joints of each are equidistant on either side of the other line with as much separation as possible;
    - ♦ So that, where a sewer line crosses over a water line, the sewer line is adequately supported to prevent it sagging or falling onto the water line and causing damage to it

- In such crossings, where the foregoing vertical and horizontal requirements are impossible to achieve:
    - ♦ The sewer shall be designed and constructed of cast iron, ductile iron, galvanized steel, or other protected steel as approved;
    - ♦ Such construction shall extend for a minimum distance of ten feet on each side of the point of crossing;
    - ♦ Mechanical joints shall be used.
- As an alternative, the Engineer may approve installation of the sewer pipe so that it is fully encased in 12-inch thick concrete for a distance at least 10-feet each side of the crossing.

02224.3.4 PRESSURE PIPE RESTRAINT

02224.3.4.1 THRUST BLOCKS - Thrust blocks and/or mechanical restraints shall be installed on pressure pipelines in accordance with these Specifications and Drawings before any hydrostatic testing is performed on the system. Pressure pipe shall be properly blocked at all fittings whenever:

- The pipeline makes a change in direction of 11 degrees or more,
- It changes size, or
- It terminates (see restraining details in Drawings).

02224.3.4.2 CONCRETE THRUST BLOCKS - Concrete thrust blocking shall be formed and placed, so that joints and fittings will be accessible. In addition, all pressure pipe 12" in diameter and larger shall have mechanical restraint furnished and installed at all joints within 60 feet each way from any bend, in addition to thrust blocks shown in the drawings.

02224.3.4.3 VISUAL INSPECTION - The Contractor shall allow the Engineer to visually inspect every thrust block before it is buried.

02224.3.5 MANHOLE INSTALLATION

0224.3.5.1 BASES - Prior to setting the base for manholes, the bottom of the excavation shall be carefully graded to provide uniform bearing and support for the manhole. Where the manhole base is cast in place, all loose material shall be removed and excavation shall be made to assure placement is made on undisturbed soil. Where pre-cast bases for manholes are used, the trench shall be over-excavated at least 6-inches and filled with granular backfill as described herein and compacted and graded to provide uniform bearing and support for the manhole. Where manholes are installed on existing piping, the base may be formed by placing concrete around and under the existing pipe and then cutting away the top one-third of the pipe to form an open channel, after the concrete has been allowed to adequately cure (see invert channels below).

02224.3.5.2 INVERT CHANNELS - Invert channels shall be formed from concrete to conform in shape and slope to that of the sewer line. The depth of the channel shall be at least three-quarters that of the diameter of the sewer pipe it serves. Adjacent floor area shall be sloped towards the invert channel to provide a minimum slope of one-inch per foot.

02224.3.5.3 JOINTS AND CONNECTIONS - All joints between manhole components shall be made watertight with a permanently flexible sealant. Connections to manholes with new piping shall be made with a rubber boot or seal which will assure a flexible, watertight seal and which conforms to ASTM C923.

The connector shall be of a size specifically designed for the pipe material and hole size placed in the wall of the manhole.

02224.3.5.4 DROP MANHOLES - Drop sewer manholes shall be constructed in accordance with the details shown on the drawings, whenever a grade difference of more than 18-inches occurs in that manhole. For grade differences of less than 18-inches, the flowline of the manhole base shall be sloped to provide a smooth transition between incoming and outgoing sewer lines.

02224.3.6 FLUSHING AND CLEANING

Prior to proceeding with testing, all sewer lines, manholes, and structures and connected piping installed under this Contract shall be flushed and cleaned. The Contractor shall provide all labor, materials, cleaning equipment, and water required to clean the system components.

Upon approval of the Engineer, the Contractor can use standard wastewater system cleaning equipment and methods, such as high-pressure washer systems and suction truck systems, to clean sewer lines and manholes as an alternative to flushing as described below.

Before isolating a specific section of line for flushing, the Contractor shall be responsible for making the necessary arrangements and appropriate piping connections to safely discharge the water used for flushing, to avoid any property damage or contamination of bodies of natural surface or ground water. The Contractor shall fill each section to be tested with clean potable water and then flush the line. The Contractor shall make the necessary arrangements so that a 2.5-foot per second flow velocity will be established in the lines during flushing. Flows required to produce the required flushing velocity indicated above are provided as follows:

FLUSHING FLOW AND VELOCITY

Pipe Diameter (inches)	Flow (gpm) to Produce 2.5 fps
4	100
6	200
8	400
10	600
12	900
16	1600

NOTE: With 40 psi residual pressure, 2 1/2 inch and 4-1/2 inch hydrant outlet nozzles will have the ability to discharge approximately 1,000 GPM and 2,500 GPM respectively.

02224.3.7 TESTING

02224.3.7.1 BACKFILL AND COMPACTION - No testing of any sewer line shall be performed until the trench has been backfilled and compacted to the appropriate unsurfaced grade or level.

02224.3.7.2 FORCE MAINS - Force mains shall be hydrostatically tested according to the requirements of AWWA - 600, Section 4, Hydrostatic Testing of Pipelines for Force Mains.

The Contractor shall furnish all necessary personnel, water, equipment, supplies, and plugging devices required to perform leakage tests as described therein. Any leaks or other deficiencies that are detected shall be repaired and the test section of pipe shall then be re-tested by the Contractor. This process shall be repeated until compliance is achieved.

02224.3.7.3 GRAVITY MAINS - All gravity main sewer piping shall be air pressure tested for exfiltration. Air pressure testing shall be accomplished in accordance with recommended practice (UNI-B-6) of the

Uni-Bell PVC Pipe Association for all pipelines less than 36-inches in diameter. Pressure testing will be made at all joints for lines 36-inches or greater in diameter. Testing will be performed with equipment equivalent to that manufactured by Cherne Industrial, Inc. and consistent with the procedure described as follows:

- All wyes, tees, and/or ends of lateral stubs shall be suitably capped and braced to withstand the internal test pressure of the section being tested. Caps shall be easily removable for making future lateral or extension connections.

- Test sections of sewer line shall be isolated by plugging at each manhole with pneumatic plugs. One of the plugs shall be fitted with connections to allow the following:

  ⇒ Inflation of the pneumatic plug.
  ⇒ Pressure measurement inside the isolated section of sewer line.
  ⇒ Introduction of air under pressure into the isolated section of sewer line.

- Air for pressurizing and gauges for measuring pressures shall be supplied through and incorporated into a control panel manufactured specifically for such testing. The control panel shall be fitted with a 3 1/2-inch (or larger), 0 to 30-psi gauge for reading the internal line pressure. Calibrations on the gauge for the 0 through 10-psi range shall be in tenths of pounds.

- Personnel will not be allowed in any involved manhole while pressure is being applied to a test section.

- Air shall be introduced into the test section until the pressure stabilizes at 3.5 psi. Then the time required for the pressure to drop to 3.0 psi shall be observed, recorded, and compared to the following table of acceptability standards:

ALLOWABLE TIME FOR A 0.5 psig TEST PRESSURE DROP IN PVC SEWER PIPE

Pipe Diam. (inches)	Minimum Time in Minutes and Seconds for Various Lengths of Pipe							
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
6	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
18	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51

If the level of any groundwater present is higher than the level of the test section, the test air pressure shall be increased until it is 4 psi greater than the average backpressure induced on the line by the ground water. At least two minutes shall be allowed for the interior air pressure to stabilize at that pressure. Pressure in the line then shall be observed until it has decreased to 3.5-psi above the groundwater backpressure. The foregoing described test for a 0.5-psi pressure drop can then be commenced.

- Exfiltration testing for all pipe and joints shall be considered acceptable when the time measured for pressure to decrease from 3.5 to 3.0 psi is equal to or greater than the time shown above in the table.

Infiltration testing also shall be conducted for all gravity main sewer lines when the groundwater level is above the top of the pipe section being tested. Tests shall be made by observing and measuring the amount of water infiltration. Testing shall be conducted from manhole to manhole.

The length of pipe to be tested shall not exceed 700 feet. The following steps shall be taken as the testing proceeds:

- Measurement of ground water elevation shall be made at the upper and lower ends of the test section and recorded. The upper end of the test section shall then be plugged and the flow of water leaving the lower end will be measured, either by directing the flow into a container of known volume of by observation of flow over a weir.

- Acceptance of the test section for infiltration compliance will be given when the rate of flow out of the section is less than 200 gallons per inch of internal pipe diameter per mile per 24-hour day.

All manholes shall be checked for infiltration by observing their interior surfaces for signs of water infiltration.

02224.3.7.4 DEFLECTION TESTING - All flexible wall sewer piping shall be tested for deflection by passing a mandrel sized to pass through a 5-percent deflection (or deformation) of the pipe section being tested. The Engineer may waive this requirement on short footage projects. Requirements for making such tests are provided as follows:

- Deflection testing shall not be conducted until backfill in the trench has been in place for at least 30 days.

- The test shall be performed by moving the mandrel through the test section without the aid of a mechanical pulling device.

- The mandrel shall be fitted with an odd number of fins or legs (at least nine) which are not worn sufficiently to affect the mandrel's diameter. The fins shall be sized to fit the specific type and size of pipe being tested and shall be stamped by the manufacturer to identify the type and size of pipe. When requested, the Contractor shall provide proof rings to check the mandrel's diameter. The length of the contact edge of the fins shall be at least equal to the pipe's nominal diameter.

- Acceptance of the test section of pipe will be given when the mandrel can pass through that section without stoppage. If stoppage occurs, the pipe shall be excavated and exposed for examination to determine if damage to the pipe has taken place. When pipe damage has occurred, the damaged section shall be removed and replaced by the Contractor. If an obstruction has been caused by deflection, but the pipe is undamaged, the Contractor shall replace the bedding as necessary and carefully re-compact the bedding and backfill. When such corrective measures are completed, the mandrel shall be passed through the test section again to assure compliance.

02224.3.7.5 TESTING DOCUMENTATION - The Contractor shall maintain a record of the procedures performed and the test results for all tests performed on pipelines installed under this Contract. Information contained on the record shall include the following:

- Identification of Contract.
- Contractor's name and name of testing entity, if performed by other than Contractor.
- Name of Test Supervisor.
- Date of test.
- Type of test (air pressure, infiltration, deflection, etc.).
- Identification of test section which includes location, size, and type of pipe.
- Test results (pass/fail, amount of leakage, etc.).
- Description of failure, if any, including reason for failure and corrective measures taken.
- Signature of Test Supervisor.
- Approval signature of Engineer or Engineer's Representative witnessing the tests.

Photocopies of the test documentation shall be provided to the Engineer within 48 hours after the tests are performed and acceptance of the test section is achieved.

02224.3.8 PIPELINE LOCATION IDENTIFIERS

The Contractor shall furnish and install all pipeline location identifiers as called for on the Plans.

02224.3.9 CLEANUP

Following acceptance of testing and completion of backfilling and surface restoration, the Contractor shall prepare the work for contract closeout in accordance with Section 01200 of these Specifications.

02224.4 METHOD OF MEASUREMENT

02224.4.1 PIPE AND APPURTENANCES

This measurement shall be made using a tape measure or other accurate measuring device to determine the total number of lineal feet of pipe in place and accepted. Measurement of pipe shall be made from inside of manhole connection to inside of manhole connection, or to the outside of other structures, and shall include the lineal measurement of valves, fittings, pipe within casings, etc., that occur in the line. This measurement also shall include all work items necessary to completion of the sewer system such as trench excavation, backfilling, compaction, and testing, as well as "furnish and install" or "install only" items such as pipe and fittings, location markers, tracer wire, and warning tape as required on the Drawings.

02224.4.2 MANHOLES

Measurement of manholes shall be made by counting the number of manholes of each of the sizes (diameters) indicated on the Drawings, with drop piping, that have been installed and accepted. Variations in the vertical depth of manholes will not be taken into consideration.

Measurement of drop manholes shall be made in the same manner and shall include the drop piping and appurtenances required for making the drop.

As with pipe, measurement for all manholes shall include all work and materials necessary for the finished, functional, and accepted construction of the manhole.

02224.4.3 CONNECTIONS TO EXISTING WORK

Measurement for connections to existing pipe, manholes, or other structures shall be made by counting the number of each type or size of connection made and accepted, as indicated on the Drawings.

02224.4.4 SERVICE TAPS

Measurement for service taps shall be made by counting each connection made to a sewer main. Such measurement shall include furnishing and installing the connection fitting, including all labor and materials required to cut and install the fitting to the main, and for the marker placed on the upstream end of the service lateral.

02224.4.5 SERVICE STUBS

A tape measure or other accurate measuring device shall be used to determine the number of lineal feet of service stub in place and accepted, measuring from the fitting on the main sewer line (service tap) to the termination point of the service stub at the property line.

02224.4.6 SERVICE LATERALS

A tape measure or other accurate measuring device shall be used to determine the number of lineal feet of service lateral, measuring from the end of the service stub at the property line to the termination point of the lateral as constructed in the field.

02224.5 BASIS OF PAYMENT

02224.5.1 The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
(*Size*)(*Type*) Sewer Pipe	Lineal Foot
(*Size*) Manhole	Each
(*Size*) Drop Manhole	Each
(*Size*) Connection to Existing (*Structure*)	Each
Service Tap	Each
(*Size*)(*Type*) Service Stub	Lineal Foot
(*Size*)(*Type*) Service Lateral	Lineal Foot

02226.1 DESCRIPTION

Includes furnishing all labor, equipment and materials required to install pipe, dispose of unsuitable materials, perform trench backfilling and compaction in conformance with Section 02200 and provide pavement restorations in conformance with Section 02500.

02226.1.1 RELATED WORK

Section 02105 - Earthwork Materials
Section 02200 - Trench Excavation and Backfill
Section 02500 - Removal and Replacement of Surface Improvements

02226.1.2 SUBMITTALS

Submit manufacturer's certification that all material furnished is in compliance with specifications, standard references, and contract requirements in accordance with Section 01300.

02226.1.3 DEFINITIONS

Pipe Zone - The area around the pipe in the trench width and up to 12-inches over the pipe.

Drainage Pipe - Perforated and non-perforated pipe used for collection and transmission of subsurface drainage.

Culvert - Pipe used for transmission of surface water under and around roadways.

02226.2 MATERIALS

The Contractor shall not change pipe size, material or class without written approval from the Engineer. Provide the type, class and size of pipe shown on the Drawings and conforming to the following:

02226.2.1 REINFORCED CONCRETE PIPE

Use Class A or B with Type II cement, which conforms to AASHTO M-170. Elliptical pipe shall be Class A or B, which conforms to AASHTO M-207 with tongue and grove joints.

02226.2.2 CORRUGATED POLYETHYLENE CULVERT PIPE

Corrugated polyethylene culvert pipe shall be Class A or B conforming to the requirements of AASHTO M-294.

02226.2.3 CORRUGATED GALVANIZED STEEL PIPE AND PIPE-ARCH

Corrugated galvanized steel pipe and pipe-arch shall be Class A, B or C, which conforms to the requirements of AASHTO M-36.

02226.2.4 CORRUGATED ALUMINUM PIPE AND PIPE-ARCH

Corrugated aluminum pipe and pipe-arch shall be Class A, B or C, which conforms to the requirements of AASHTO M-196 and M-197.

02226.2.5 PVC DRAIN PIPE

Solid wall and perforated drain pipe with rubber gasketed joints, which conforms to the requirements of ASTM D2729. Perforation shall follow the ASTM D2729 perforation pattern of 2, one-half inch holes 120° apart with 5-inch spacing.

02226.2.6 PE DRAIN PIPE

Corrugated solid wall and perforated drainpipe with rubber gasketed joints, which shall conform to ASTM F405.

02226.2.7 DRAIN GRAVEL

Drain Gravel shall comply with the requirements provided in Section 02105.

02226.2.8 GEOTEXTILE FABRIC

Geotextile Fabric shall be as called for on the Drawings and specified in Section 02950.

02226.3 CONSTRUCTION REQUIREMENTS

02226.3.1 HANDLING AND STORAGE OF PIPE

The Contractor shall handle and store pipe to prevent damage by crushing or piercing and in such a way as to prevent contamination. Any pipe delivered to the Work site, which does not conform to specifications or is scratched, bent, cracked, chipped or otherwise damaged, shall be rejected. The Contractor shall protect pipe and components against dirt and damage during shipment and storage and shall store pipe in strict conformance with the manufacturer's recommendations. The Contractor shall not store PE or PVC plastic pipe in direct sunlight for more than 30 days.

02226.3.2 PREPARATION

The Contractor shall verify location of existing utilities and structures ahead of pipe laying operation. If pipe adjustment is necessary due to location of other utilities, secure approval from Engineer prior to proceeding.

02226.3.3 TRENCHWORK

The Contractor shall excavate trenches in accordance with Section 02200. The Contractor shall repair unstable subgrade for pipe installation by over-excavating to stable soils or a minimum 8-inches depth and replace with approved stabilization material.

02226.3.4 DEWATERING

The Contractor shall keep the pipe trenches free from water during pipe installation by a method acceptable to the Engineer.

The Contractor shall be responsible for damages of any nature resulting from the dewatering operations, notwithstanding approval of the method by the Engineer.

02226.3.5 SHORING

The Contractor shall provide trench shoring and protection in accordance with applicable OSHA standards and Section 01510.

02226.3.6 INSTALLATION

02226.3.6.1 PLACEMENT – Pipe placement shall be as follows:

- The Contractor shall handle and install pipe as per manufacturer's specific instructions.
- The Contractor shall make bellholes and depressions only of such length, depth and width as required for properly accommodating the particular type of pipe joint being installed.
- The Contractor shall join pipe in accordance with manufacturer's recommendation or as specified in piping specification section.
- Pipelines shall be laid on uniform grades.
- Do not install pipe at a grade less than 0.5%.
- Lay gravity flow pipe upgrade beginning at lower end.
- Pipe shall not be installed without continuous support under the barrel.
- The Contractor shall obtain written approval from the Engineer to deflect pipe from true line and grade. Do not exceed deflection allowed by pipe manufacturer's recommendation.
- The Contractor shall not lay pipe in water or when trench conditions or weather are unsuitable for such work.
- The Contractor shall place circular concrete pipe which contains elliptical reinforcing so that the reference lines designating the top of the pipes will not be more than 5° from the vertical plane through the longitudinal axis of the pipe.
- Not more than 300 feet of continuous pipe placement will be allowed without the installation of an inlet box, catch basin, combination box, clean-out box, manhole or other such structure.

02226.3.6.2 CUTTING TOOL - The Contractor shall use an approved machine or cutting tool recommended by the pipe manufacturer to cut pipe.

02226.3.6.3 DAMAGED PIPE - The Contractor shall remove and relay any section of pipe already placed which is found to be out of alignment, defective or damaged.

02226.3.6.4 PLUGS - The Contractor shall provide plugs for pipeline branches, stubs or other open ends, which are not to be immediately connected. The Contractor shall use a joint comparable to the main line joints and thrust block as required to secure plugs.

02226.3.6.5 GALVANIZED PIPE - The Contractor shall provide protection to galvanized pipe to prevent scratches or abrasion and assure that the coating is not damaged. Remove and replace damaged pipe sections when directed by the Engineer. Provide proper facilities for lowering sections of pipe into trenches.

02226.3.6.6 CONNECTION TO CONCRETE - The Contractor shall form, size and finish structures connecting piping in accordance with the details of the Drawings and Section 03100. The Contractor shall install mortar in joints at catch basins, clean-outs, manholes, etc. Remove all loose material and soil from the surface on which concrete will be placed. Non-metallic pipe shall be thoroughly wetted prior to pouring the collars.

02226.3.6.7 PIPE BEDDING - Unless otherwise shown on these Contract Documents, culverts shall be bedded with on site bedding materials or imported bedding, which conforms to Section 02105. Drainage piping shall be bedded in accordance with the details shown on the Drawings with material which also conforms to Section 02105.

02226.3.6.8 BACKFILL - The Contractor shall compact trench backfill in accordance with the requirements of Section 02200 and 02222.

02226.3.7 INSPECTION

Prior to starting backfill of trenches, the Contractor shall notify the Engineer of completion of pipe laying and allow the Engineer to check all installed drain piping and culverts. When access to installed pipe is determined necessary for checking by the Engineer, the Contractor shall open any covering as requested. If defects are found, the Contractor shall make the necessary corrections at no cost to the Owner. If no defects are found, the cost of uncovering and recovering shall be an additional expense covered by the Owner in accordance with the General Conditions (Section 00700).

02226.4 METHOD OF MEASUREMENT

02226.4.1 PIPE AND CULVERTS

Measurement of drainage piping and culverts shall be made by using a tape measure or other accurate measuring device to determine the number of lineal feet of pipe or culvert, along the centerline of the pipe, installed and accepted. This measurement shall include the lengths of all in-line fittings and shall stand as the measurement of all other work involved with the pipe installation such as trenching, backfilling, and site restoration as required.

02226.4.2 ENTRANCE AND EXIT STRUCTURES

Measurement of culvert or drainage pipe entrance and exit structures and measurement of culvert end sections shall be separate from the lineal measurement of the pipe and shall be made by counting the number of such structures built and accepted.

02226.4.3 OTHER WORK AND MATERIALS

The method of measurement for other work and materials such as drain rock, geotextile fabric, and import bedding and backfill will be described separately when called for on the Drawings, in these Specifications, or required by the Engineer.

02226.4.4 DEWATERING

Dewatering of trenches is considered incidental to the construction. The Contractor shall include all associated costs for trench dewatering in the lump sum contract price.

02226.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
(Diameter, Type) Culvert Pipe	Lineal Foot
(Diameter, Type) Drain Pipe	Lineal Foot
Entrance/Exit Structures	Each
Culvert End Section	Each

Payment for other materials, (i.e., drain rock, imported bedding and backfill, geotextile fabrics, etc.) will be made in accordance with their respective specification requirement.

02250.1 DESCRIPTION

This section describes the construction and installation of clay cutoff walls in trench excavations to inhibit the movement of groundwater and/or to prevent the drainage of wetlands or other surface water features following backfill.

02250.1.1 RELATED WORK

Not Used.

02250.1.2 DEFINITIONS

Not Used.

02250.2 MATERIALS

Clay used for construction of the clay cutoff wall shall be "pit run bentonite" and shall exhibit a permeability of $1X10^{-6}$ cm/sec.

02250.3 CONSTRUCTION REQUIREMENTS

The Contractor shall furnish and install clay cutoff wall for backfill in trenches where influenced by groundwater. The clay cutoff wall shall act as a flow curtain to stop groundwater piping in trenches and along pipelines.

02250.3.1 INSTALLATION

Clay cutoff wall shall be installed the total trench width from the bottom of the trench to 2 feet above groundwater static level or finished grade, whichever is lower. Clay cutoff walls shall be a minimum of 3 feet thick. Clay cutoff walls shall be constructed at each end of the water bearing portion of a trench excavation and at intermediate intervals not to exceed 400 feet where groundwater exists

02250.3.2 COMPACTION

Material shall be compacted to 90% maximum density. Proctors shall be taken for materials used, furnished by the Contractor's independent geotechnical testing laboratory, or by the supplier of approved clay.

02250.3.3 PIPE BEDDING

Clay shall be used to bed pipe, and shall be installed as specified herein for "pipe bedding".

02250.3.4 FINISH

Finished grade and surface improvements over clay cutoff walls shall be as specified herein and shown on the drawings.

02250.4 METHOD OF MEASUREMENT

Measurement for this bid item shall be made by counting the number of completed and accepted clay cutoff walls installed in the project.

02250.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAYMENT ITEM	UNIT
Clay Cutoff Wall	Each

02500.1 DESCRIPTION

This work includes removal and restoration of existing features, public or private, including but not limited to asphalt or concrete pavement, concrete structures, curb and gutter, sidewalk, gravel surfacing, driveways, crosswalks, landscaping, field crops, irrigation ditches, fences, culverts, buried or exposed utilities, abandoned utilities, small utility buildings and the disposal of resulting waste materials and debris.

02500.1.1 RELATED WORK

Section 01510 - Protection of Existing Properties
Section 02015 - Clearing and Grubbing
Section 02200 - Trench Excavation and Backfill
Section 02511 - Hot Plant Mix Bituminous Surfacing
Section 02520 - Pavement Cutting
Section 02900 - Landscaping

02500.1.2 SUBMITTALS

When any improvement not owned by the Owner is designated for restoration work, then, upon completion of such restoration, the Contractor shall obtain a written statement of acceptance or release from the responsible owner of the feature. This statement, in turn, will be submitted to the Engineer for his review and approval prior to acceptance of the work for payment.

02500.1.3 DEFINITIONS

Not used.

02500.2 MATERIALS

02500.2.1 GENERAL

When restoration of a feature is indicated in the Contract Documents, such work shall be accomplished so as to restore the feature to its original, or better, condition and/or function as it existed prior to removal.

It is recognized that exact duplication of materials cannot always be achieved, but reasonable effort is expected from the Contractor to restore the feature with materials which will provide the same or better service and appearance as observed prior to removal.

All materials shall be new.

02500.2.2 BITUMINOUS SURFACE

02500.2.2.1 PRIMER OR TACKER COAT – Shall be an approved bituminous material such as type MC-70-250, SS1, or CS-1.

02500.2.2.2 PATCHING AND REPAIR - Plant mix material that meets or exceeds the requirements of Section 02511 herein, or of the local State Department of Transportation for asphalt surface road repair, shall be used for patching and repair.

02500.2.2.3 SURFACING – Shall be hot or cold mix bituminous surfacing, meeting or exceeding the requirements of Sections 02511 or 02512 herein, or of the local State Department of Transportation for asphalt surface road repair.

02500.3 CONSTRUCTION REQUIREMENTS

02500.3.1 UNCLASSIFIED REMOVAL AND RESTORATION

02500.3.1.1 EXISTING IMPROVEMENTS - All existing facilities disturbed by the Contractor in prosecution of the Work, including but not limited to asphalt or concrete pavement, concrete structures, curb and gutter, sidewalk, gravel surfacing, driveways, crosswalks, landscaping, field crops, irrigation ditches, fences, culverts, buried or exposed utilities, abandoned utilities, small utility buildings or any other structures or obstructions designated to be removed on the Drawings, by the Engineer, or these Specifications, shall be removed, cleaned up, and then restored or replaced in kind by the Contractor in new condition.

02500.3.1.2 ADJACENT IMPROVEMENTS - Care shall be exercised in such removal to assure that adjacent facilities or structures, which are to remain, are not disturbed. Any damage to such existing facilities or structures resulting from carelessness or negligence on the Contractor's part shall be satisfactorily restored to new condition at the Contractor's expense.

02500.3.1.3 VEGETATION - Trees, shrubs, and other landscape plants designated to be saved for replanting shall be carefully removed, bundled, set aside and protected for replanting by the Contractor. Turf Sod to be saved for replanting shall be removed by machine cutting. In lieu of removal and replacement of turf sod or field crops, the Contractor may, upon approval of the property owner, remove and replant the same. Such agreements shall be documented on the final property release to be signed by the property owner.

Replanting of landscape items shall be performed in accordance with Section 2900.

02500.3.2 TOPSOIL

02500.3.2.1 REMOVAL AND PROTECTION - In all construction areas where re-growth of vegetation is desired, and when called for by the Contract Documents, the Contractor shall remove, segregate, stockpile, store, and protect topsoil during excavation in accordance with Section 02900. Topsoil shall be kept free from contamination from foreign materials and other soils. The Contractor shall arrange construction activities to avoid damage or disturbance to the stockpiled soil.

02500.3.2.2 REPLACEMENT - When backfill operations have been completed, the topsoil shall be replaced and restored to the original contours or as called for on the Drawings, in accordance with Section 2900 of these Specifications.

02500.3.3 GRAVEL SURFACE

02500.3.3.1 REMOVAL - When restoration of graveled driveways, roadways, or parking areas is required, the existing gravel surfacing shall be graded off and stockpiled safely away from ongoing work activities, to prevent contamination with subsurface materials. It may then be reapplied and compacted during restoration activities.

02500.3.3.2 RESTORATION - Areas to be restored shall be backfilled and graded to uniform lines and compacted to the density prescribed for trenching in Section 02200. Existing gravel surfacing materials shall then be replaced in uniform 3 inch layers compacted to 95% of maximum density. After compaction, the affected area shall be graded smooth. Sufficient new material of equal or better quality shall be applied and mixed in, to replace materials lost during prosecution of the Work, to ensure a 3-inch minimum gravel cover after compaction and grading.

02500.3.4 BITUMINOUS SURFACE

02500.3.4.1 REMOVAL - Bituminous pavement surface shall be removed and restored in accordance with this paragraph unless provisions for restoration are made in other Sections of these Specifications. The pavement surface, public or private, designated for removal shall be removed to neat lines, which shall be cut in accordance with Section 02520. No ripping or rooting will be permitted outside of the limits of the cut lines.

Existing driveways, sidewalks, etc., which do not match the new finish grade as shown on the Drawings, also shall be removed preparatory to restoration work.

02500.3.4.2 DISPOSAL - Surfacing materials removed shall be disposed of in accordance with Section 1520 of these Specifications, and will not be permitted in the backfill, except as specifically authorized by the Engineer and in accordance with local requirements.

02500.3.4.3 RESTORATION – Restoration of bituminous surface shall proceed according to the following steps:

- First, the sub-grade shall be graded to a uniform surface, and 6 inches of Untreated Base Coarse (UBC) gravel shall be placed over the area in lifts not thicker than 3 inches, compacted to 95% of its maximum density.

- Then, the exposed edges of existing pavement shall be primed with a material approved for this purpose.

- Unless shown otherwise on the drawings or required otherwise by the Engineer, hot or cold mix bituminous surfacing shall be spread and compacted in individual, 3-inch maximum lifts over the base course. Minimum thickness of the new bituminous surfacing layer shall be equal to the adjacent surface thickness, but shall be not less than 3 inches thick when compacted to 95% of its maximum density.

- Rolling operations shall be conducted in such a manner that shoving or distortion will not develop beneath the roller. The surface shall be finished to a smooth, uniform line and grade with surface deviations not exceeding plus or minus 1/4 inch in 10 feet, unless the surface is subject to more stringent State, County, or Municipal requirements. The determination of smoothness compliance may be made with a straight edge or string line at the option of the Engineer. Any irregularities shall be satisfactorily corrected at the sole expense of the Contractor.

- Existing driveways, sidewalks, etc., which were removed because they did not match the new finish grade, shall be replaced and restored to their original or better condition to match the new finish grade shown on the Drawings, or as directed by the Engineer.

02500.3.5 REMOVAL AND RESTORATION OF CONCRETE IMPROVEMENTS.

02500.3.5.1 REMOVAL - Existing concrete pavement in streets, alleys, driveways, sidewalks, etc., public or private, shall be cut in accordance with Section 02520, and removed to the lines indicated on the Drawings, or as directed by the Engineer. No ripping or rooting will be permitted outside of the limits of saw cut lines.

Existing driveways, sidewalks, etc., which do not match the new finish grade as shown on the Drawings, also shall be removed preparatory to restoration work.

02500.3.5.2 DISPOSAL - All materials removed shall be disposed of in accordance with Section 1520 of these Specifications, and will not be permitted in the backfill, except as specifically authorized by the Engineer and in accordance with local codes.

02500.3.5.3 RESTORATION - Sub surface preparations shall be the same as those in paragraph 02500.3.4.3 above.

- Concrete pavement including sidewalks, driveways, roadways, and parking area surfacing shall be replaced by the Contractor in accordance with Division 3 of these Specifications, unless otherwise directed by the Engineer

- Those existing driveways, sidewalks, etc., which were removed because they did not match the new finish grade, shall be replaced and restored to their original or better condition to match the new finish grade shown on the Drawings, or as directed by the Engineer.

- All other concrete improvements shall be restored in accordance with details shown on the Drawings, or as directed by the Engineer, and as required by the provisions of Division 3 of these Specifications.

02500.3.6 REMOVAL AND RESTORATION OF FENCES

When necessary to remove any fence to facilitate its operation, the Contractor shall obtain prior agreement with the owner of the fence for its removal. Temporary containment measures shall be provided, if needed, at no additional expense to the Owner. As soon as practical, the permanent fence shall be restored to its original condition or better.

02500.3.7 RESTORATION OF IRRIGATION DITCHES

Restoration of irrigation ditches shall be made in such a manner that the ditch configuration and size will be equivalent to its original condition and the ditch will be located on its original alignment. Any embankment required to restore the original slope of the ditch will be layer compacted with mechanical compaction equipment to 90% of maximum dry density determined by AASHTO T-99.

02500.3.8 CLEANUP

Areas of construction activity shall be left in a condition of uniform grade, blending into pre-existing contours and concealing, as much as possible, evidence of construction activity by back dragging or raking to conceal tire marks. Cleanup and disposal of surplus materials shall be performed in accordance with Section 1520.

02500.4 METHOD OF MEASUREMENT

02500.4.1 NO BID SCHEDULE LINE ITEM

When the Bid Schedule in the Contract does not contain a line item for "Removal and/or Restoration of Surface Improvements", then this work will be considered incidental to other items included in the Bid Schedule, and no separate measurement shall be made for this work.

02500.4.2 “DESIGNATED AREA” LINE ITEM

Measurement for removal and/or of surface improvements in a designated area shall be the "lump sum" of the work required to remove and properly dispose of materials resulting from removal.

02500.4.3 “DESIGNATED FEATURE” LINE ITEM

Measurement for removal and/or restoration of designated features shall be per unit as described in the Bid Schedule.

02500.4.4 BITUMINOUS SURFACE PAY LIMIT

Measurement for bituminous surface removal and replacement shall be made by multiplying the pay limit by the actual length of removal and replacement in lineal feet as determined using a tape measure or other accurate measuring device.

In general, for pipe trench excavation, the pay limit shall be determined by the formula W = OD + 18 inches (pay limit width equals pipe outside diameter plus 18 inches), rounded up to the nearest standard bucket width. Actual measurement may be modified according to information indicated on the Drawings or as directed by the Engineer.

The pay limit for removal of bituminous surface for other purposes shall be as shown on the Drawings or directed by the Engineer.

02500.4.5 DAMAGED ITEMS

Measurement of items damaged or removed as a result of the Contractor's negligence shall not be allowed and no payment will be made under this contract.

02500.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit prices as follows:

PAY ITEM	UNIT
Removal of Site Surface Improvements	Lump Sum
Removal of (*Name of Structures*)	Each
Removal of Sidewalk	Square Yard
Removal of Fences	Lineal Foot
Removal of Driveway Slabs	Square Yard
Removal of Curb and Gutter	Lineal Foot
Replace (*Name of Structure*)	Each
Replace (*Thickness*) Sidewalks	Square Yard
Replace (*Thickness*) Driveway Slabs	Square Yard
Replace (*Description*) Fence	Lineal Foot
Replace (*Description*	Lineal Foot or Lump sum
Restore (*Description*)	Lineal Foot or Lump Sum

02510.1 DESCRIPTION

This special provision covers all sampling and testing of subgrade and pavement materials. The materials sampling and testing shall be done by an independent certified testing company and all testing reports shall be submitted to the Engineer within a reasonable time period.

02510.1.1 RELATED WORK AND REFERENCED SECTIONS

Section 02200 – Trench Excavation and Backfill
Section 03050 – Portland Cement Concrete

02510.1.2 SUBMITTALS

All sampling and test reports shall be submitted in accordance with Section 01300.

02510.1.3 DEFINITIONS

Not used.

02510.2 MATERIALS

Not used.

02510.3 CONSTRUCTION REQUIREMENTS

02510.3.1 TESTING

The minimum testing requirements are as follows:

02510.3.1.1 EMBANKMENT

• Maximum Laboratory Density	1 test in each soil type
• Field Density and Moisture	1 test per 2000 square yards

02510.3.1.2 BACKFILL

• Field Density and Moisture	2 tests per culvert or structure (Refer to Section 02200 for Trench Excavation and Backfill Testing)

02510.3.1.3 UNTREATED BASE COURSE

• Sieve Analysis	1 test per production day
• Maximum Laboratory Density	1 test per 10,000 tons
• Field Density and Moisture	1 test per 2000 square yards

02510.3.1.4 ASPHALT CONCRETE PAVEMENT

• Mix design (ASTM 1559 and AASHTO T-283)	1 mix design for the project
• Asphalt temperature	As necessary to assure compliance
• Gradation and Asphalt Content	2 tests per production day
• Field Density	1 test per 1600 square yards
• Mix and Laydown Temperature	As necessary to assure compliance
• Thickness	1 test per 1600 square yards

02510.3.1.5 PORTLAND CEMENT CONCRETE

- Slump Test — 1 test per 50 cubic yards
- Air Test — 1 test per 50 cubic yards
- Strength Test — 1 compressive strength per 50 cubic yards

02510.4 METHOD OF MEASURMENT

Measurement for this pay item will be by the lump sum.

02510.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price:

PAY ITEM	UNIT
Materials Sampling and Testing	Lump Sum

02511.1 DESCRIPTION

Includes manufacturing, transporting, laying and compacting hot mixtures of bituminous surfacing for roads, parking areas, sidewalks and other traffic surfaces.

02511.1.1 RELATED WORK

Section 02500 – Removal and Replacement of Surface Improvements
Section 02513 - Asphalt Tack Coat

02511.1.2 SUBMITTALS

02511.1.2.1 MIX DESIGN - The Contractor shall develop and submit proposed mix-designs based on the Marshall Method for Hot Asphalt Paving Mixtures as established in AASHTO T 245. The submittal shall include a laboratory report incorporating all of the information required by that specification, together with curves developed from the mix designs showing varying percentages of asphalt by dry weight of mix versus unit weight, percent air voids, stability, flow and percent voids in mineral aggregate.

02511.1.2.2 JOB MIX FORMULA – At least 15 days prior to producing bituminous mixtures, the Contractor shall submit to the Engineer, in writing, a proposed job-mix formula for each mixture for use in setting the job-mix formula to be used with the proposed materials For bituminous mixtures, the proposed job-mix formula shall be based on a mix-design-run on aggregates, crushed or otherwise, produced for the project and using the bituminous material that will be furnished for the project.

Each job-mix formula shall propose definite single values (hereafter referred to as Target Values or TV) for:

- The percentage of aggregate passing each specified sieve based on the dry weight of aggregate. These percentages shall be within the range shown in Table 2-H.
- The percentage of bituminous material to be added based on the total weight of mixture.
- The temperature of the mixture as it leaves the mixer.
- The temperature of the mixture placed on the road immediately preceding initial compaction of the mixture.
- The kind and percentage of additives to be used (Hydrated lime may be added to prevent stripping).
- The kind and percentage of mineral filler to be used.
- The percentage of water, based on the total dry weight of mixture.
- The maximum specific gravity of dense graded hot mix bituminous paving mixtures as determined by AASHTO T 209 (For open graded hot mixes, the laboratory density developed during mix design shall be used as the TV. It shall be the maximum density for the TV bituminous content).
- The mixture shall have a minimum dry retained strength value of 200 psi.

After reviewing the Contractor's proposed job-mix formula, the Engineer shall determine a job-mix formula with single values for the nine parameters listed above, and so notify the Contractor in writing.

Should a change in source of material be proposed, or should a job-mix formula prove unsatisfactory, the Contractor shall establish a new job-mix formula and shall submit same to the Engineer.

02511.1.2.3 PENETRATION/VISCOSITY/TEMPERATURE RELATIONSHIPS - The Contractor shall submit penetration/viscosity/temperature relationships for the bituminous material to be used in the Work along with a certification from the supplier attesting to their accuracy. If the supplier finds it desirable or necessary to change crudes or blends of crudes, new relationships must be supplied along with a sample to use in running a new mix-design. This submittal shall be made not less than 15 days prior to delivery of material from the changed source of materials. The penetration and viscosity values shall be determined at the temperatures and by the procedures specified in AASHTO M 226.

02511.1.3 DEFINITIONS

Plant - Stationary machinery used for manufacturing mixtures of asphalt cement, liquid asphalt with aggregate to form a uniform mixture of bituminous surfacing. Sometimes referred to as "batch plant".

Aggregate - Crushed stone, gravel or slag with uniform particle sizes.

Gradation - A group of particle size limits that are prescribed for aggregate.

Job-Mix Gradation - A gradation of aggregate which has been developed by a contractor or material supplier which can consistently be produced from a given source.

Job-Mix Formula - A mixture of asphalt materials and aggregate which can be consistently produced from a given source with the available plant of a contractor or material supplier.

Course - A single layer of bituminous surfacing.

Mat - Single or multiple layers of bituminous surfacing which have been placed.

Lot - The amount of bituminous mixture placed during a production day.

02511.2 MATERIALS

02511.2.1 ASPHALT CEMENT

Shall meet the requirements of AASHTO M 20 for penetration-graded asphalt cement and AASHTO M 226 for viscosity-graded asphalt cement. When not shown otherwise, the Contractor shall use viscosity grade AC-20 asphalt cement for the bituminous mixture.

02511.2.2 AGGREGATES

Aggregates for hot bituminous mixtures shall be crushed stone, slag or gravel meeting the quality and gradation requirements shown below in Tables 1-H and 2-H, unless shown otherwise in the Contract Documents.

When crushed gravel is used, at least 50 percent by weight of the particles retained on the Number 4 sieve shall have at least one mechanically fractured face.

TABLE 1-H CRUSHED AGGREGATE QUALITY REQUIREMENTS FOR HOT BITUMINOUS PAVEMENT.

Description	AASHTO Test Method	Requirements
Percent Wear	T 96	40 max.
Durability Index, Coarse and Fine	T 210	35 min.
Sand Equivalent (Alternative Method Number 2)	T176	45 min
Stripping Test	T 182	Min. 95% coated**

** An approved chemical additive may be used to meet this requirement.

TABLE 2-H GRADATION LIMITS FOR CRUSHED AGGREGATE USED IN HOT BITUMINOUS SURFACING.

Sieve Size	Percent of Total Aggregate (dry weight)			
	1-inch (1)	¾-inch (2) (Non-rutting)	¾-inch (3)	½-inch (4)
1 inch	100			
¾ inch		100	100	
½ inch	75-91	74-99		100
3/8 inch		69-91	75-91	
No. 4	47-61	49-65	46-62	60-80
No. 8		33-47		
No. 16	23-33	21-35	22-34	28-42
No. 50	12-22	6-18	11-23	11-23
No. 200	5-9	2-6	5-9	5-9

When aggregate is produced and/or stockpiled in more than one size, the blend of sizes shall be based on results of mix design properties that yield the most ideal results. The blended gradations; however, must stay within the gradation limits given herein.

02511.3 CONSTRUCTION REQUIREMENTS

02511.3.1 BITUMINOUS SURFACE MIXING, PLACEMENT, AND FINISHING

02511.3.1.1 PLANT DESIGN AND EQUIPMENT - Plants shall be specifically designed and manufactured to produce a uniform bituminous mixture. The plant shall be capable of controlling and accurately proportioning both aggregates and asphalt cement. Automatic controls shall be provided to shut down the plant when a supply of aggregate or bituminous material is not available.

The plant shall be equipped with appropriate dust collectors and/or control equipment, which enable operation of the plant to meet local and State environmental and health requirements. Liquids from a wet scrubber, when used, shall not be discharged into live streams, lakes or ponds. Effluent from such equipment shall be collected and deposited according to applicable State and local requirements.
Thermometers shall be installed in the plant to accurately indicate the temperature of the bitumen at the charging value in the mixer unit and at the discharge chute of the mixer unit.

Accurate weight measurement of ingredients is essential. Bituminous mix plants shall have associated weight measurement equipment (scales, etc.) with an incremental accuracy of not more than 10 pounds to weigh materials.

02511.3.1.2 MIXING - The aggregates, bituminous material, additives, mineral filler and water shall be measured or gauged and introduced into the mixer in the amount specified by the job mix formula. The bituminous material shall be evenly heated to the specified temperature. A continuous supply of the bituminous material shall be fed to the mixer at a uniform temperature. The temperatures of asphalt cement delivered to the mixer shall be sufficient to achieve a kinematic viscosity of 150 to 300 centistokes.

Aggregate for pugmill mixing shall be heated, dried, and delivered to the mixing unit at a temperature within $\pm$30°F of the temperature of the bitumen, temperature not to exceed 325 degrees F. Moisture content of the aggregate shall not exceed 1 percent at the time it is introduced into the mixing unit. Flames used for drying and heating shall be properly adjusted to avoid damage to, and soot formation on, the aggregate.

After the required amounts of all materials have been introduced into the mixer, the ingredients shall be mixed until a complete and uniform coating of the particles and a thorough distribution of the bituminous material throughout the aggregate have been obtained.

02511.3.1.3 HAULING - Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a material to prevent the mixture from adhering to the beds. Truck beds shall not contain any water or deleterious material prior to loading.

The Contractor, at no cost to the Owner, shall provide scales for weighing the vehicles used for hauling the bituminous mixture. If of the required accuracy, these scales may be the same as those used to weigh ingredients at the mix plant. The Contractor shall provide such scales at no additional cost to the Owner

02511.3.1.4 PLACEMENT - Except for small areas inaccessible to such equipment, hot bituminous mixtures shall be placed with bituminous pavers. Pavers shall be self-contained, power-propelled units, provided with an adjustable activated-screed or strike-off assembly, heated if necessary, and capable of spreading and finishing courses of bituminous plant mix material in lane widths and thickness' as shown on the Drawings. When shown on the Drawings, pavers shall be equipped with a control system capable of automatically maintaining the proper screed elevation.

Placement of the bituminous mixture shall be continuous. The mixture shall be spread and struck off to the grade and elevation established in the Contract Drawings. Unless otherwise shown on the Drawings, mix shall be placed in lifts which, when compacted, will not exceed 4-inches in thickness.

The longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6-inches, making sure that the joint in the top layer shall be at the center or dividing line of every two-lanes of traveled roadway. Transverse joints in succeeding layers and in adjacent lanes shall be offset at least 10-feet.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable (along forms, curbs, headers, walls and other places), the mixture shall be placed and finished using hand tools and then thoroughly compacted with hot hand tampers, smoothing irons or mechanical tampers.

Bituminous surface shall not be placed when: weather conditions prevent proper handling, hauling and placing of the mixture; when the base course is frozen; or when the average temperature of the underlying surface is below 35 degrees F. and air temperature is rising. Placement on water covered surfaces will not be permitted.

02511.3.1.5 COMPACTION - Compaction shall be performed with vibratory or non-vibratory steel-wheel rollers and pneumatic-tire rollers. Initial breakdown rolling shall be accomplished while the mix

temperature exceeds 250° F. Rolling shall be completed before the mix temperature drops to 175° F.

Rollers shall begin at the sides and proceed longitudinally parallel to the road centerline, each trip overlapping 6-inches or two times the pavement depth, whichever is greater, gradually progressing to the center. When paving in echelons or abutting a previously placed lane, the longitudinal joint should be rolled first, then followed by the above rolling procedure. On super-elevated curves, the rolling shall begin at the low side and progress to the high side.

Rollers shall not pass over the unprotected end of a freshly laid mixture. Transverse joints shall be formed by cutting back into the previous run to expose the full depth of the course. Heat shall be applied to contact surfaces of transverse joints just before additional mix is placed against them.

02511.3.2 EXCESS BITUMINOUS SURFACE MATERIAL.

Material trimmed from the edges, together with any other discarded bituminous mixture, shall be removed from the roadway and disposed of by the Contractor in an approved area.

02511.3.3 TESTING

02511.3.3.1 CONTRACTOR TESTING - The Contractor shall be responsible for providing the necessary tests for controlling and maintaining the mixture within the limits indicated in the approved job-mix formula. Sampling and testing will be performed on each lot of material as it is placed. Gradation and asphalt content samples will be taken immediately behind the paver at the following rate:

LOT TESTING

Lot Size –Sq.Yds.	Minimum Number of Samples
1500 and greater	4
Less than 1500	3

Density and thickness samples will be taken at a rate of one sample per each lot of up to 1500 square yards. When lot size exceeds 1500 square yards, two samples will be taken.

Checks for smoothness will be made at locations selected by the Engineer for each lot. Smoothness checks will not be required where design transitions will not allow compliance with the criteria.

Acceptance of bituminous material placed shall be made by comparing test results with the job-mix formula and the dimensions provided in these Specifications. Acceptance of each lot will be given when test results are within the following tolerances:

BITUMINOUS TEST

Test	Maximum Deviation
Asphalt Content	Mean of tests on each lot is less than 1%
Gradation	Mean of tests for any sieve size is less than 10%
Density	Any test is 92% or greater
Thickness	Any test is less than 0.5-inches
Smoothness	0.25-inches in 10-feet longitudinally or transversely

Any corrective measures necessary to bring the bituminous surface into compliance must be made while the surface temperature is still greater than 175° F.

See Subsection 02511.5.2 – PRICE ADJUSTMENTS, below.

02511.3.3.2 ENGINEER TESTING – At his own discretion, the Engineer also may spot-check the bituminous mix for acceptability and for determination of compliance with installation requirements. These spot-checks will not be used for acceptance but for guidance. On request, the results will be made available to the Contractor by the Engineer.

02511.4 METHOD OF MEASUREMENT

02511.4.1 NO SEPARATE MEASUREMENT

No separate measurement shall be made for furnishing and installing bituminous surface when it is an integral component of a structure or facility shown as another line item in the Bid Schedule.

02511.4.2 SEPARATE MEASUREMENT

When bituminous surface is shown as a separate pay item in the Bid Schedule, measurement shall be made by counting and adding together each square yard of surface in place and accepted. This measurement shall include furnishing all necessary materials and equipment, labor, weighing, mixing, hauling, placement, compaction, and testing to produce an acceptable bituminous surface.

02511.5 BASIS OF PAYMENT

02511.5.1 ACCEPTED QUANTITIES

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
(Depth) Hot Plant Mix Bituminous Surfacing	Square Yards

02511.5.2 PRICE ADJUSTMENTS

02511.5.2.1 DEVIATIONS FROM CRITERIA - For deviations from criteria provided by the approved job-mix formula and in these Specifications and Drawings, the unit price shown in the Bid Schedule will be adjusted by application of the pay factor shown in the tables below:

TABLE A - THICKNESS DEFICIENCY

Pay Factor	Average Core Thickness Deficiency (In Inches)
100	0.00 - 0.25
90	0.26 - 0.50
80	0.51 - 0.75
50	0.76 - 1.00
Remove and Replace	More than 1.00

TABLE B - NON-COMPLYING COMPACTION TESTS

Test Method	Pay Factor	Percent Of Bulk Density Target

		Mean of all Tests	Lowest of all Tests
ASTM D 3203	1.00	95 to 100	90 or greater
(Rice Method)	0.90	95 to 100	Less than 90
	0.80	92 to 95	90 or greater
	0.50	Less than 92	90 or greater

TABLE C - NON-COMPLYING BITUMEN CONTENT AND AGGREGATE GRADATION

Criteria	Pay Factor	Mean Deviation Of Number Of Tests In Test Lot									
		1 Test		2 Tests		3 Tests		4 Tests		5 or more Tests	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Bitumen Content	1.00	0.0	0.7	0.0	0.54	0.0	0.46	0.0	0.41	0.0	0.38
	0.975	0.0	0.8	0.55	0.61	0.47	0.52	0.42	0.46	0.39	0.43
	0.95	0.0	0.9	0.62	0.68	0.53	0.58	0.47	0.52	0.44	0.47
	0.90	0.0	1.8	0.69	0.75	0.59	0.64	0.52	0.56	0.48	0.52
	0.85	0.0	1.1	0.76	0.82	0.65	0.69	0.57	0.61	0.53	0.56
½" and larger Sieve	1.00	0.0	10.0	0.0	7.3	0.0	6.3	0.0	5.6	0.0	5.2
	0.975	11.0	12.0	7.4	8.3	6.4	7.1	5.7	6.3	5.3	5.8
	0.95	13.0		8.4	9.3	7.2	7.9	6.4	7.0	5.9	6.4
	0.90	14.0		9.4	10.3	8.0	8.7	7.1	7.7	6.5	7.1
	0.85	15.0		10.4	11.3	8.8	9.5	7.8	8.4	7.2	7.7
3/8" Sieve	1.00	0.0	9.0	0.0	6.9	0.0	5.9	0.0	5.3	0.0	4.9
	0.975	10.0		7.0	7.8	6.0	6.6	5.4	5.9	5.0	5.5
	0.95	11.0		7.9	8.7	6.7	7.3	6.0	6.6	5.6	6.1
	0.90	12.0	13.0	8.8	9.6	7.4	8.0	6.7	7.2	6.2	6.6
	0.85	14.0		9.7	10.5	8.1	8.9	7.3	7.9	6.7	7.2
No. 4 Sieve	1.00	0.0	9.0	0.0	6.7	0.0	5.7	0.0	5.2	0.0	4.8
	0.975	10.0		6.8	7.6	5.8	6.3	5.3	5.8	4.9	5.4
	0.95	11.0		7.7	8.5	6.4	6.9	5.9	6.4	5.5	5.9
	0.90	12.0	13.0	8.6	9.4	7.0	7.5	6.5	7.0	6.0	6.5
	0.85	14.0		9.5	10.2	7.6	8.0	7.1	7.6	6.6	7.0
No. 8 Sieve	1.00	0.0	7.0	0.0	5.6	0.0	4.8	0.0	4.3	0.0	4.0
	0.975	8.0		5.7	6.3	4.9	5.4	4.4	4.8	4.1	4.5
	0.95	9.0		6.4	7.0	5.5	6.0	4.9	5.3	4.6	4.9
	0.90	10.0		7.1	7.7	6.1	6.6	5.4	5.8	5.0	5.4
	0.85	11.0	12.0	7.8	8.5	6.7	7.2	5.9	6.4	5.5	5.8
No. 16 Sieve	1.00	0.0	7.0	0.0	5.2	0.0	4.6	0.0	4.2	0.0	3.9
	0.975	8.0		5.3	5.8	4.7	5.1	4.3	4.6	4.0	4.3
	0.95	9.0		5.9	6.4	5.2	5.6	4.7	5.1	4.4	4.7
	0.90	10.0		6.5	7.0	5.7	6.1	5.2	5.5	4.8	5.1
	0.85	11.0	12.0	7.1	7.6	6.2	6.6	5.6	5.9	5.2	5.4
No. 50 Sieve	1.00	0.0	6.0	0.0	4.3	0.0	3.8	0.0	3.4	0.0	3.2
	0.975	7.0		4.4	4.8	3.9	4.1	3.5	3.8	3.3	3.5
	0.95	8.0		4.9	5.3	4.2	4.5	3.9	4.1	3.6	3.8
	0.90	9.0		5.4	5.8	4.6	4.9	4.2	4.4	3.9	4.1
	0.85	10.0		5.9	6.4	5.0	5.5	4.5	4.9	4.2	4.5

02511.5.2.2 REMOVAL OF MIX - The Engineer may order the removal of the mix if the mean result of the lot acceptance tests deviate from the job-mix formula for a particular sieve or sieves, or if the asphalt content is more than the values shown under the 0.85 pay factor in Table C. Where material not meeting this criteria is allowed to remain, a pay factor of 0.50 will be applied.

When the tested density percentage pay factor in Table B is multiplied by the pay factor shown in Table C, and the product is less than 0.80, the Engineer may order removal of the mix. Where material not meeting this criteria is allowed to remain, a pay factor of 0.50 will be applied.

02511.5.2.3 ADDITIONAL MIX - When a lot shows a deficient thickness of more than 0.5-inches, the Engineer may order additional material to be placed and additional payment for the material required will be allowed. When excess thickness is determined, the Engineer may allow it to remain in place; however, only 50 percent of the mix in excess of the 0.5-inch tolerance will be paid for.

02511.5.2.4 OPTIMAL ASPHALT CONTENT PERCENTAGE - Optimal asphalt content percentage will be determined from the job-mix formula provided by the Contractor unless the bituminous mixture is obtained from an established commercial asphalt plant. In such case, the optimum percentage may be determined from previous mixes which meet the criteria provided in these Specifications.

02513.1 DESCRIPTION

This section covers preparing an existing bituminous or concrete surface and then furnishing and applying an asphalt coating to it.

02513.1.1 RELATED WORK

Section 02511 - Hot Plant Mix Bituminous Pavement
Section 02512 - Road Mix Bituminous Pavement

02513.1.2 SUBMITTALS

The Contractor shall provided certificates from the paving asphalt vendor indicating the type and grade of material being provided and its compliance with the standards indicated herein.

02513.1.3 DEFINITIONS

Not used.

02513.2 MATERIALS

The asphalt coating shall meet the current requirements contained in the "Standard Specifications for Paving and Industrial Asphalts" issued by the Asphalt Institute, for the type and grade of asphalt shown on the Drawings or in these Specifications. When the asphalt type and grade are not shown on the Drawings or in these Specifications, SS-1 or SS-1h emulsified asphalt diluted with not more than one part water to one part emulsified asphalt will be acceptable.

02513.3 CONSTRUCTION

02513.3.1 WEATHER LIMITATIONS

Tack coats shall be applied only when air and roadbed temperatures in the shade are greater than 50° F. Application of tack coats shall not be made during rain, fog, dust, or other unsuitable weather.

02513.3.2 PREPARATION

Prior to application of the tack coat, the receiving surface shall be broomed to remove dust and loose foreign materials. The Contractor shall provide notice of application to adjacent property owners 24 hours prior to applying the coating. Appropriate measures shall be taken to provide crossings for foot or vehicular traffic to minimize tracking of freshly applied tack coating.

If flushing of the surface with water is necessary for removal of dust and foreign material, the Engineer may require flushing. When flushing is ordered, the Contractor will be authorized compensation for flushing by issuance of a Change Order.

02513.3.3 APPLICATION

Limit application of tack coats to areas which can be covered with an asphalt pavement layer that same day when possible.

Application of the coating shall be accomplished with a distributor designed, equipped, maintained and operated so that bituminous material will be applied at an even temperature and uniform rate on variable widths of surface up to 16-feet. The distributor must be capable of controlling rates of application from 0.05 to 2.0 gallons per square yard, with uniform pressure

and with a variation from the rate set not to exceed 0.02 gallon per square yard. Operable measuring equipment shall be included on the distributor which includes a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperature of the bituminous in the tank. Distributors shall be equipped with (1) a power unit for the pump; (2) full circulation spray bars that adjust laterally and vertically; and (3) a hose and nozzle attachment for applying material to areas inaccessible to the distributor spray bar.

Spray rates for the coating shall be as required by the Drawings or these Specifications. When no rate is specified otherwise, the Engineer may require an application rate for emulsions of 0.05 to 0.15 gallons per square yard.

02513.3.4 PROTECTION

Protect adjacent structures,(curbing, sidewalks, guardrails, sign posts, etc.) from being spattered or marred by covering with suitable materials. The expense of removal of such spattering shall be born by the Contractor.

Traffic shall not be allowed to travel over the freshly applied coating until it has cured sufficiently to not be picked up by traffic.

02513.4 METHOD OF MEASUREMENT

Measurement of Asphalt Tack Coat shall be by the ton or gallon for the type and grade of material furnished and applied.

02513.5 BASIS OF PAYMENT

The accepted quantity will be paid for at the contract unit cost for:

PAY ITEM	UNIT
Asphalt Tack Coat (*Type/Grade*)	Ton
Asphalt Tack Coat (*Type/Grade*)	Gallon

PAVEMENT SAW CUTTING — SECTION 02520

02520.1 DESCRIPTION

This section covers cutting through designated sections of bituminous and/or concrete pavement surface with approved equipment in preparation for pavement removal.

02520.1.1 RELATED WORK

Section 02500 - Removal and Replacement of Surface Improvements
Section 02200 - Trench Excavation and Backfill
Section 02208 - Flowable Backfill (required during winter months)

02520.1.2 SUBMITTALS

Not used.

02520.1.3 DEFINITIONS

Not used.

02520.2 MATERIALS

Not used

02520.3 CONSTRUCTION REQUIREMENTS

02520.3.1 SAW CUTTING

02520.3.1.1 NEATNESS IN CUTTING - Pavement cuts shall be made with a saw to produce straight vertical cuts through the full depth of the surfacing layer. The Contractor is responsible to preserve and maintain a neat clean edge on the cut pavement to facilitate pavement repair or replacement under Section 2500.

02520.3.1.2 CUT MATERIALS TO BE LEFT IN PLACE - Cut pavement materials shall be left in place. Removal of cut pavement will be included as part of other work items in this Contract.

2520.3.1.3 BROKEN PAVEMENT - When pavement has deteriorated or is severely cracked and broken, the Contractor shall discontinue cutting operations and obtain direction from the Engineer as to how cutting should proceed.

If pavement is broken after sawcutting and prior to replacement, the Contractor shall re-cut the pavement. Such re-cutting shall not be measured for payment.

02520.3.2 WHEEL CUTTING

With advanced written approval of the Engineer, wheel cutting may be substituted for saw cutting of bituminous pavement surface. Wheel cutting operations shall be subject to the same requirements as those for saw cutting pavement above.

02520.3.3 ROTOMILLING

Rotomilling of existing pavement is an acceptable alternative to saw cutting, providing that the resulting pavement edges are left clean and neat. Rotomilled material may be suitable for trench backfilling or as a substitute for road base. For such use, rotomilled material must meet the following conditions: that: no chunks or pieces larger than one inch in any dimension are used,

that it is placed in separate lifts from untreated base course, that it is compacted to 95% of its maximum density, and that it is acceptable to the Engineer and to the Owner.

02520.4 METHOD OF MEASUREMENT

Measurement for pavement cutting shall be made using a tape measure or other accurate measuring device to determine the number of lineal feet of pavement cut. This length shall be multiplied by the actual depth of the cut pavement layer, measured in inches, to give the number of inch feet of cut.

An alternative method of measurement is for the engineer to determine that all pavement cutting shall be paid for by the measured lineal feet without regard to depth.

02520.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
Pavement Sawing	Inch/Foot
Pavement Sawing	Lineal Feet

02810.1 DESCRIPTION

This section covers furnishing and installing chain link fence and gates as indicated on the Drawings

02810.1.1 RELATED WORK

Section 03050 - Portland Cement Concrete

02810.1.2 SUBMITTALS

Not used.

02810.1.3 DEFINITIONS

Not used.

02810.2 MATERIALS

02810.2.1 FENCING FABRIC, SUPPORT, AND CONNECTORS

02810.2.1.1 FABRIC - Fence fabric shall be in accordance with ASTM A-392 and have the following characteristics:

FENCE FABRIC CHARACTERISTICS

Height	6'-0"
Mesh	2 inch, coated
Size Wire	11 gauge
Coating	Zinc (galvanized)

02810.2.1.2 TOP RAIL - Top rail shall be 1 5/8 inch OD, galvanized steel pipe @ 1.82 lbs./ft., or fence tube of equivalent structure, size and strength.

02810.2.1.3 WIRE RING TIES - Use wire ring ties that carry a Class II coating and are 11-gauge wire in accordance with ASTM A-116.

02810.2.1.4 BARBED WIRE - Barbed wire for extension arms shall have the following characteristics:

BARBED WIRE CHARACTERISTICS

Total Number Strands	3 strands barb wire
Wires per Strand	2
Wire Size	12 gauge (minimum)
Barbs	14 gauge, 4 point @ 4" o.c.
Coating	Zinc (galvanized)

02810.2.1.5 TENSION WIRE - Tension wire shall be 7 gauge galvanized coil spring steel wire in accordance with ASTM A-641.

02810.2.1.6 TRUSS RODS - Truss rods shall be 3/8 inch galvanized steel rod.

02810.2.1.7 EXTENSION ARMS - Extension arms for gate and other fence posts shall be fabricated from galvanized steel. They shall be designed and manufactured to carry three separate strands of barbed wire and shall be capable of supporting a 200-pound vertical load at the end of the arm without causing permanent deflection. Gateposts shall be provided with vertical extension arms while all other post shall have 45° angle extension arms. The top rail shall pass through the extension arm fitting.

02810.2.2 POSTS

All pipe posts shall be provided with tops that shed water. All posts, rails, and appurtenances shall be provided in accordance with ASTM A-120, A-121, A-123 or A-153, respectively.

02810.2.2.1 LINE POSTS - Line posts shall be "H" section at 4.10 pounds per lineal foot, or 2-3/8 inch OD galvanized pipe at 3.12 pounds per lineal foot, or fence tube of equivalent size and strength.

02810.2.2.2 END, CORNER, AND PULL POSTS - End, corner and pull posts shall be 2-7/8 inch OD pipe at 4.64 pounds per lineal foot, galvanized pipe or fence tube of equivalent size and strength.

02810.2.2.3 GATEPOSTS - Except where shown otherwise in the Contract Documents, gateposts shall be provided in accordance with the table below. Gateposts shall be Schedule 40 galvanized steel pipe of the diameter and weight shown. Fence tube of equivalent size and strength may be substituted for the galvanized steel pipe specified herein.

GATEPOST SPECIFICATIONS

Leaf Width	**Gate Post OD**	**Lbs per Lineal Ft**	**Concrete Foundation**	
			Diameter	Depth
0’ – 6’	2-7/8”	5.7	12”	3’-0”
Over 6’ to 13’	4”	9.0	18”	4’-0”
Over 13’ to 18’	6-5/8”	18.9	18”	4’-0”
Over 18’	8-5/8”	28.5	18”	4’-6”

02810.2.3 GATES

02810.2.3.1 TYPE AND SIZE - Swing gates of the type and size shown on the Drawings shall be used for all chain link fence gates.

02810.2.3.2 FRAME - Gate frame piping shall be 1 7/8 inch OD galvanized pipe weighing 2.68 pounds per lineal foot. Corner fittings shall be heavy pressed steel or malleable castings.

02810.2.3.3 CATCH AND LOCK - Gates shall be provided with an appropriate steel or malleable iron catch and locking attachment. Double swing gates shall be provided with a center rest and catch mechanism. Stops shall be provided to hold gates open.

02810.2.3.4 FABRIC - Chain link fence fabric used to cover gate frames shall conform to the same standards as the line fence fabric.

02810.2.4 CONCRETE

Concrete for setting posts and other fencing components for chain link fence and gates shall be Class 2000 or higher with 3/4 inch maximum aggregate in accordance with Section 03050 of these Specifications.

02810.3 CONSTRUCTION REQUIREMENTS

02810.3.1 GENERAL

Finished fence shall be plumb, taut, true to line and grade, and complete in all details. Fence shall be installed with a top rail and a bottom tension wire. Top rail shall provide allowance for expansion and contraction due to temperature differential in the coupling devices. The ground shall be graded before fence posts are located to permit the grade of the fence to remain uniform over any local elevations or depressions in the ground line. Any resultant surplus soil or concrete, etc., shall be removed and the line shall be cleaned up prior to completion of the Work.

02810.3.2 POSTS

02810.3.2.1 BRACING - End, corner, pull, slope and gateposts shall be braced to the midpoint of the nearest line post or posts with horizontal braces used as compression members. The bracing material shall be the same as top rail material. The brace posts shall be trussed from the brace back to the bottom of the end, corner, slope or gatepost with steel truss rods with turnbuckles, or other suitable tightening devices used as tension members.

2810.3.2.2 LINE POST PLACEMENT - Line posts shall be placed in accordance with the following spacing requirements:

LINE POST PLACEMENT

Radius of Curve	Maximum Post Spacing
Tangent Section to 500 ft	10 ft.
200 ft. to 499 ft.	8 ft.
100 ft. to 199 ft.	6 ft.
0 ft. to 99 ft	5 ft.

02810.3.2.3 PULL POST PLACEMENT - Pull posts shall be located at 500-foot maximum intervals and/or at all angle points exceeding 20°.

02810.3.3 CONCRETE

02810.3.3.1 DEPTH OF SET - Post sockets in concrete walls shall be set to a minimum depth of 18 inches. Line posts shall be set in concrete to a minimum depth of 18 inches. End, pull, corner and gateposts less than 6 inches in diameter shall be set in concrete to a minimum depth of 24 inches. Gateposts 6 inches diameter and greater shall be set in concrete to a depth of 30 inches

A minimum of 6 inches concrete shall be placed in each posthole below each post depth of set described in the foregoing paragraph.

02810.3.3.2 FINISH - Concrete for fence posts shall be finished with a minimum of 1 inch of concrete left above finish grade and sloped in all directions to allow water to drain away from the post.

02810.3.4 FENCE FABRIC

02810.3.4.1 PLACEMENT - Fence fabric shall be installed on the outward facing side of the posts and parallel to the line of the fabric. It shall be 1 inch above the ground on straight grade with the top edge projecting over the top rail of the fence. Space between the bottom of the fence and the finished ground line shall not exceed 3 inches.

02810.3.4.2 FASTENING - Fence fabric shall be stretched taut and securely fastened to the posts, the top rail and the bottom tension wire. Install the tension wire.

Fabric shall be attached to line posts every 14 inches with 11 gauge hot dip galvanized wire clips or galvanized steel bands. It shall be attached to terminal, corner, and gateposts every 14 inches by using 1/4" x 3/4" tension bars tied to the posts with 1 inch wide, hot-dip galvanized steel bands and 3/8 inch diameter bolts and nuts. Attach to both the top rail and the tension wire with 11 gauge wire ring ties spaced every 24 inches.

02810.3.5 CHAIN LINK GATE

02810.3.5.1 INSTALLATION - Chain link gates of size and type shown on the Drawings shall be installed plumb, level and secure for full opening without interference. The gates shall be installed at the locations shown, unless approved otherwise by the Engineer. Ground items shall be set in concrete for anchorage as recommended by fence manufacturer.

The corners of gate frames shall be fastened together and reinforced with fittings designed for the purpose or by welding. All welds shall be ground smooth.

02810.3.5.2 FABRIC - Chain link fence fabric shall be attached to gate frames with tension bars and tie wire attached to suitable tension connectors spaced at approximately 15 inches at each end, and to the top and bottom rails with tie wires spaced at approximately 24 inches.

02810.4 METHOD OF MEASUREMENT

Measurement for chain link fence shall be made using a tape measure or other accurate measuring device to determine the number of lineal feet of fence installed and accepted. This measurement shall include all work and materials, excavation, concrete and concrete placement, gates and bends, etc., all to be furnished and installed as shown on the Drawings and described herein.

02810.5 BASIS OF PAYMENT

PAY ITEM	UNIT
Chain Link Fence	Lineal Foot

02950.1 DESCRIPTION

This section covers furnishing and installation of geotextile fabric of the type and configuration shown on the Drawings or specified in the Contract Documents.

02950.1.1 RELATED WORK

Section 02200 - Trench Excavation and Backfill
Section 02202 - Roadway Excavation and Embankment
Section 02201 - Earthwork for Structures

02950.1.2 SUBMITTALS

The Contractor shall submit manufacturer's descriptive literature, which identifies and describes applications, physical properties and characteristics of geotextile filter fabric materials to be used for this contract, in accordance with Section 01300 of these Specifications. Upon request of the Engineer, the Contractor shall supply samples for examination or testing.

02950.1.3 DEFINITIONS

Not used.

02950.2 MATERIALS

02950.2.1 FOR RIPRAP AND DRAINAGE CHANNELS

Unless shown otherwise on the Drawings or in Contract Documents, filter fabric materials for installation under riprap in drainage channels, or for lining structural footing drainage components shall be TREVIRA Spunbond type 011/250, MIRIFI 180/N or an approved equal with the following characteristics:

FILTER FABRIC CHARACTERISTICS

Grab Tensile Strength, ASTM D-4632	210 lb.
Elongation at Failure, ASTM D-4632	50%
Trapezoid Tear Strength, ASTM D-4533	75 lb.
Puncture Strength, ASTM D-4833	95 lb.
Mullen Burst Strength, ASTM D-3786	360 psi.
Permeability - k, ASTM D-4491	0.3 cm/sec.
Permittivity, ASTM D-4491	1.4 sec^{-1}
Vertical Water Flow, ASTM D-4491	110 gpm/ft^2
Apparent Opening Size*, ASTM D-4751	0.210 mm

*Maximum Opening Size

02950.2.2 FOR EMBANKMENTS AND FOUNDATIONS

Requirements for geotextile fabric materials used for embankment or foundation stabilization other than that specified above will be provided in the Special Provisions of the Contract Documents.

02950.3 CONSTRUCTION REQUIREMENTS

Filter fabric materials shall be installed in strict accordance with the manufacturer's instructions and recommendations. Care shall be taken at all times to prevent puncturing or tearing of the

fabric materials during placement under embankment or riprap materials. Joints of fabric sheets shall be lapped in accordance with the manufacturer's instructions and fastened securely in place with fasteners to prevent gaps and misalignment during coverage with earth materials.

02950.4 METHOD OF MEASUREMENT

02950.4.1 Geotextile fabrics will be considered incidental to installation of riprap and drainage gravel envelopes and no separate measurement shall be made.

02950.4.2 When shown separately as an item in the Bid Schedule, geotextile fabric shall be measured to the nearest tenth square yard determined from field measurements of surface areas on which each type of the fabric is installed, excluding overlaps.

02950.5 BASIS OF PAYMENT

02950.5.1 When geotextile fabric materials are furnished and installed incidental to other items in the Bid Schedule, no separate payment shall be made.

02950.5.2 When shown in the Bid Schedule as a separate item, the accepted quantities will be paid for at the contract unit price for:

PAYMENT ITEM	UNIT
Geotextile Fabric (*Type*)	Square Yard

02951SP GEOMEMBRANE LINER

2951.1 GENERAL

2951.1.1 SCOPE

This specification covers the technical requirements for the Manufacturing and Installation of the geomembrane. All materials meet or exceed the requirements of this specification, and all work will be performed in accordance with the procedures provided in these project specifications

2951.1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. D 1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
   2. D 1238 Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
   3. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
   4. D 1603 Test Method for Carbon Black in Olefin Plastics
   5. D 3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
   6. D 4218 Standard Test Method for Determination of Carbon Black in Polyethylene Compounds
   7. D 4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
   8. D 5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
   9. D 5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
   10. D 5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
   11. D 5994 Standard Test Method for Measuring Core Thickness of Textured Geomembranes
   12. D 6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
   13. D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
   14. D 7240 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test)

B. Geosynthetic Research Institute
   1. GRI GM 13 Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
   2. GRI GM 17 Test Properties, Testing Frequency and Recommended Warranty for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

2951.1.3 DEFINITIONS

A. Lot - A quantity of resin (usually the capacity of one rail car) used in the manufacture of geomembranes. Finished roll will be identified by a roll number traceable to the resin lot used.
B. Construction Quality Assurance Consultant (CONSULTANT) - Party, independent from MANUFACTURER and INSTALLER that is responsible for observing and documenting activities related to quality assurance during the lining system construction.
C. ENGINEER- The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications.
D. Geomembrane Manufacturer (MANUFACTURER) - The party responsible for manufacturing the geomembrane rolls.
E. Geosynthetic Quality Assurance Laboratory (TESTING LABORATORY) - Party, independent from the OWNER, MANUFACTURER and INSTALLER, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site or during manufacturing, usually under the direction of the OWNER.

F. INSTALLER- Party responsible for field handling, transporting, storing, deploying, seaming and testing of the geomembrane seams.
G. Panel- Unit area of a geomembrane that will be seamed in the field that is larger than 100 ft2.
H. Patch - Unit area of a geomembrane that will be seamed in the field that is less than 100 ft2.
I. Subgrade Surface - Soil layer surface which immediately underlies the geosynthetic material(s).

2951.1.4 SUBMITTALS POST-AWARD

1. Section 01 33 00; Submission Procedures
2. Product Data:
    a. Provide specification sheets for geomembrane
    b. Provide mill test reports for geomembrane roll stock used to make liner
    c. Provide shop test reports for each fabricated panel produced
    d. Provide field test reports for all welds completed in the field

2951.1.5 QUALITY ASSURANCE

A. The OWNER will engage and pay for the services of a Geosynthetic Quality Assurance Consultant and Laboratory to monitor geomembrane installation.

2951.1.6 QUALIFICATIONS

1. The Geomembrane Installer shall have at least three years experience in the installation of the geomembrane. The Geomembrane Installer shall have installed at least 500,000 m2 (5,000,000 ft2) geomembrane during the last three years.
2. Geomembrane Installer shall be certified by the geomembrane manufacturer and follow manufacturer's installation specifications

2951.1.7 MATERIALS

Geomembrane:

1. Geomembrane material
   Enviro Liner 6040 coextruded material with one white and one black surface and a black core layer.
2. Surface: Smooth, no striations, gels, pinholes or bubbles.
3. Thickness (ASTM D 5199): Avg. thickness must exceed value with no individual reading lower than 10% below the average: 1.00 mm (40 mil; 0.040 inches).
4. Maximum Membrane Density (ASTM D792 or ASTM D1505): ≤ 0.939 g/cc.
5. Minimum Tensile Properties (ASTM D638 or ASTM D6693): Machine direction and perpendicular to machine direction average values on the basis of five (5) test specimens each direction:
    a. Break Strength: 31 kN/m (180 lb/in).
    b. Break Elongation: 1000% calculated from a gauge length of 38mm (1.5").
6. Minimum Trapezoidal Tear Resistance (ASTM D4533): 400 N (90 lb).
7. Minimum Puncture Resistance (ASTM D4833): 298 N (67 lb).
8. Total Pigment Content: >2.0%
    a. Includes both carbon black and white pigments (when present)
    b. Measured by Carbon Black content test ASTM D6370 (or D4218)
9. Carbon Black Dispersion (ASTM D5596):
    a. Measured on black layers only
    b. Carbon Black dispersion for 10 different views:
    c. Minimum nine views in categories 1 or 2 and 1 view in Category 3.
10. High Pressure Oxidative Induction Time (ASTM D5885):
    a. Minimum 2000 minutes.
11. Stress Crack Resistance under Constant Load (ASTM D5397): Minimum 1000 hours.
12. UV Resistance (ASTM D4329)MATERIAL LABELING, DELIVERY, STORAGE AND HANDLING
    a. Minimum 90% strength retained after 30,000 hours testing
        i. Testing performed on 0.75mm (30 mil) specimen
        ii. Irradiance of 0.90 w/m at a wavelength of 310 nm
        iii. Alternating 10 hour UV cycles at 60C followed by 2 hour condensation cycles at 50C
13. Axi-Symmetric Break Resistance (ASTM D5617)

a. Minimum: 50%

14. Methane Permeability (ASTM D1434 tested on EL 6030)
    a. Transmission Rate: <2.11x10-4 m3/(m2 • day)
15. Solvent Vapour Transmission (ASTM D814 tested on EL 6040):
    a. ASTM Fuel C: ≤10 g/(m2 • hr)
    b. Ethanol: ≤10 g/(m2 • hr)
    c. Methanol: ≤10 g/(m2 • hr)
    d. ASTM IRM 903: ≤10 g/(m2 • hr)
16. Shop Seam Properties (ASTM D6392):
    a. Shear Strength: 10.5 kN/m (60 lb/in).
    b. Peel Strength: 8.8 kN/m (50 lb/in).
17. Field Seam Properties (ASTM D6392):
    a. Shear Strength: 7.9 kN/m (45 lb/in).
    b. Peel Strength: 7.0 kN/m (40 lb/in).

A. Labeling Roll – Each roll of geomembrane delivered to the site shall be labeled by the MANUFACTURER. The label will identify:
    a. manufacturer's name
    b. product identification
    c. thickness
    d. length
    e. width
    f. roll number
B. Labeling Boot Sleeves– Geomembrane boot sleeves delivered to the site shall be labeled by the MANUFACTURER. The label will identify:
    a. manufacturer's name
    b. product identification
    c. thickness
    e. diameter
B. Delivery- Boot sleeves and rolls of liner will be prepared to ship by appropriate means to prevent damage to the material and to facilitate off-loading.
C. Storage- The on-site storage location for geomembrane material, provided by the CONTRACTOR to protect the geomembrane from punctures, abrasions and excessive dirt and moisture for should have the following characteristics:
    a. level (no wooden pallets)
    b. smooth
    c. dry
    d. protected from theft and vandalism
    e. adjacent to the area being lined
D. Handling- Materials are to be handled so as to prevent damage.

2951.1.8 WARRANTY

1. Section 01 78 10: Warranties
2. Provide a manufacturer's pro-rated weathering warranty for Enviro Liner 6030
3. Twenty five (25) years for black-surfaced geomembrane in manufacturer's approved application.
4. Fifteen (15) years for white-surfaced geomembrane in manufacturer's approved applications.

2951.1.9 EQUIPMENT

A. Welding equipment and accessories shall meet the following requirements:
    1. Gauges showing temperatures in apparatus such as extrusion welder or fusion welder shall be present.
    2. An adequate number of welding apparati shall be available to avoid delaying work.
    3. Power source must be capable of providing constant voltage under combined line load.

2951.1.10 DEPLOYMENT

A. Assign each panel a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.

B. Visually inspect the geomembrane during deployment for imperfections and mark faulty or suspect areas.
C. Deployment of geomembrane panels shall be performed in a manner that will comply with the following guidelines:
    1. Geomembranes shall be installed according to site-specific specifications, and GSE Conductive should be installed with the Conductive layer down.
       Note: A spark tester or ohm meter can be used to determine Conductive layer.
    2. Unroll geomembrane using methods that will not damage geomembrane and will protect underlying surface from damage (spreader bar, protected equipment bucket).
    3. Place ballast (commonly sandbags) on geomembrane which will not damage geomembrane to prevent wind uplift.
    4. Personnel walking on geomembrane shall not engage in activities or wear shoes that could damage it. Smoking will not be permitted on the geomembrane.
    5. Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATV's and trucks are acceptable if wheel contact is less than 8 psi.
    6. Protect geomembrane in areas of heavy traffic by placing protective cover over the geomembrane.
D. Sufficient material (slack) shall be provided to allow for thermal expansion and contraction of the material.

2951.1.11 FABRICATION

1. Set Up
    a. Carefully transfer rolls of geomembrane from storage to unwinding rack.
    b. The floor or table must be clean, dry, and free of foreign objects that could damage the liner.
    c. Pull panels to specified length, after double-checking dimensions on the work order.
    d. Ensure seaming equipment is in good repair and functioning properly. Ensure equipment is adjusted to the material.
    e. Follow documented welding procedures.
2. Qualification Seams
    a. Prepare and test qualification seams at the frequency required in ASTM D7982
    b. The qualification seam must be run using the same material and equipment that will be used for fabrication.
    c. Machine conditions and operator used for fabrication must be the same as those used for the qualification weld.
    d. Qualification seam must be tested in shear and peel and meet the specified requirements for the material as stated in the materials section.

2951.1.12 FIELD QUALITY ASSURANCE

A. MANUFACTURER and INSTALLER shall participate in and conform to all terms and requirements of the Owner's quality assurance program. CONTRACTOR shall be responsible for assuring this participation.
B. Quality assurance requirements are as specified in this Section and in the Field Installation Quality Assurance Manual if it is included in the contract.
C. Field Testing
    1. Non-destructive testing may be carried out as the seaming progresses or at completion of all field seaming.
        a. Vacuum Testing
            1) Shall be performed in accordance with ASTM D 5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
        b. Air Pressure Testing
            1) Shall be performed in accordance with ASTM D 5820, Standard Practice for Pressurized Air Channel Evaluation of Dual Seamed Geomembranes.
        c. Spark Tesing
            1) Shall be performed accordance with ASTM D 7240 Standard Practice for Leak Location using Geomembranes with an Insulating Layer in Intimate Contact with a Conductive Layer via Electrical Capacitance Technique (Conductive Geomembrane Spark Test).
        d. Other approved methods.
    2. Destructive Testing (performed by CONSULTANT with assistance from INSTALLER)
        a. Location and Frequency of Testing

1) Collect destructive test samples at a frequency of one per every 500 lineal feet of seam length.
2) Test locations will be determined after seaming.
3) Exercise Method of Attributes as described by GRI GM-14 (Geosynthetic Research Institute, http://www.geosynthetic-institute.org) to minimize test samples taken.

b. Sampling Procedures are performed as follows:
1) INSTALLER shall cut samples at locations designated by the CONSULTANT as the seaming progresses in order to obtain field laboratory test results before the geomembrane is covered.
2) CONSULTANT will number each sample, and the location will be noted on the installation as-built.
3) Samples shall be twelve (12) inches wide by minimal length with the seam centered lengthwise.
4) Cut a 2-inch wide strip from each end of the sample for field-testing.
5) Cut the remaining sample into two parts for distribution as follows:
a) One portion for INSTALLER, 12-inches by 12 inches
b) One portion for the Third Party laboratory, 12-inches by 18-inches
c) Additional samples may be archived if required.
6) Destructive testing shall be performed in accordance with ASTM D 6392, Standard Test Method for Determing the Integrity of Non-Reinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
7) INSTALLER shall repair all holes in the geomembrane resulting from destructive sampling.
8) Repair and test the continuity of the repair in accordance with these Specifications.

3. Failed Seam Procedures
a) If the seam fails, INSTALLER shall follow one of two options:
1) Reconstruct the seam between any two passed test locations.
2) Trace the weld to intermediate location at least 10 feet minimum or where the seam ends in both directions from the location of the failed test.
b) The next seam welded using the same welding device is required to obtain an additional sample, i.e., if one side of the seam is less than 10 feet long.
c) If sample passes, then the seam shall be reconstructed or capped between the test sample locations.
d) If any sample fails, the process shall be repeated to establish the zone in which the seam shall be reconstructed.

2951.1.13 REPAIR PROCEDURES

A. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.
B. Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test.
C. INSTALLER shall be responsible for repair of defective areas.
D. Agreement upon the appropriate repair method shall be decided between CONSULTANT and INSTALLER by using one of the following repair methods:
1. Patching- Used to repair large holes, tears, undispersed raw materials and contamination by foreign matter.
2. Abrading and Re-welding- Used to repair short section of a seam.
3. Spot Welding- Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.
4. Capping- Used to repair long lengths of failed seams.
5. Flap Welding- Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap.
6. Remove the unacceptable seam and replace with new material.

E. The following procedures shall be observed when a repair method is used:
1. All geomembrane surfaces shall be clean and dry at the time of repair.
2. Surfaces of the polyethylene which are to be repaired by extrusion welds shall be lightly abraded to assure cleanliness.
3. Extend patches or caps at least 6 inches for extrusion welds and 4 inches for wedge welds beyond the edge of the defect, and around all corners of patch material.

F. Repair Verification
1. Number and log each patch repair (performed by CONSULTANT).
2. Non-destructively test each repair using methods specified in this Specification.

2951.1.14 METHOD OF MEASUREMENT

A. The Geomembrane liner furnishing and installation shall per square foot, as measured parallel to the liner surface, including designed anchor trench material and its based upon net lined area.

B. Net lined area is defined to be the true area of all surfaces to be lined plus designed burial in all anchor trenches, rubsheets, and sacrificial layers.

C. Prices shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals.

D. 10 oz NW Geotextile, 270 mil DS Geocomposite w/ 6oz nw, Vents, and HDPE Embedment Strips will be included in the cost of the liner and will not be a separate bid item.

E. Prices also include doing all the work involved in performing geomembrane installation completely as shown on the Drawing, as specified herein, and as directed by the ENGINEER.

2951.1.15 BASIS OF PAYMENT

A. When shown in the Bid Schedule as a separate item, the accepted quantities will be paid for at the contract unit price for:

PAYMENT ITEM	UNIT
Filter Fabric (*Type*)	Square Yard
Geotextile	Square Yard
Geomembrane Liner	Square Yard

03050.1 DESCRIPTION

This section contains requirements for Portland cement concrete materials and concrete mix designs.

03050.1.1 RELATED MATERIALS AND WORK

Section 03100 - Concrete Forming, Finishing and Curing
Section 03200 - Concrete Reinforcement
Section 03300 - Concrete Structures and Slabwork
Section 03500 - Pre-Cast Concrete Components
Section 03600 - Grout and Mortar

03050.1.2 SUBMITTALS

03050.1.2.1 PROPOSED MIX DESIGN - Each proposed mix design shall be submitted at least 14 days prior to its use in the Work. Indicate whether mix has been designed for pumping. Mix design submittals shall include the following information:

- Water-cement ratio.
- Proportion of materials in the mix.
- Source and type of cement.
- Analysis of water to be used, unless potable.
- Type and name of admixtures applied. Indicate when accelerating or retarding admixtures are to be used and the resulting change in placement times.
- Slump, air content, and temperature of samples.
- Unit weights of fresh and dry light weight concrete.
- Any applicable and verifiable test documentation available if the submitted mix design has been used by the Contractor in prior projects.

03050.1.2.2 AGGREGATE TEST REPORT - Aggregate Test Report (submit for each aggregate source):

- Data of test analysis.
- Sieve analysis.
- Organic impurities.
- Sodium sulfate soundness test.
- Reactivity of aggregate.
- Complete identification of source of aggregate.

03050.1.2.3 CHANGES IN MIX DESIGN - After the design of the mix or mixes has been approved by the Engineer, neither the source, character, or grading of the aggregate, nor the brand or type of cement shall be changed, without 48 hours written notice to the Engineer. Should such changes become necessary, no concrete containing such new or altered materials shall be placed until the revised mix design has been submitted to the Engineer for review and approval.

03050.1.3 DEFINITIONS

Workability - The ease of placing, consolidating and finishing freshly mixed concrete.

Consolidation - Hand rodding or mechanically vibrating actions which give freshly mixed concrete the characteristics of a thick fluid so as to minimize voids when set.

Hydration - The chemical reaction between water and calcined limestone resulting in the excellent bonding properties of the cement particles with one another and with the aggregates in the mix.

Curing – Synonymous with the hydration reaction. May be enhanced by procedures which assure the retention of sufficient moisture to allow the reaction to go as far to completion as possible.

Strength - The maximum resistance of a mortar or concrete specimen to axial compressive loading expressed in psi.

Admixtures - Chemical additives to concrete mixes intended to adjust setting time, reduce water demands, increase workability and entrain air.

Air Entrainment - Introduction of chemicals to concrete mixtures which produce microscopic air bubbles which improve the workability and ability to resist deterioration due to freezing.

Reinforcement - Materials formed or mixed in concrete mixtures, to increase the ability of the concrete to withstand loading when set (hardened).

Water-Cement Ratio - The weight of the water divided by the weight of the cement in a concrete mixture.

Tempering - The addition of water to mixed concrete after arrival on site.

03050.2 MATERIALS

03050.2.1 CEMENT

03050.2.1.1 SITE-PLACED CONCRETE - For site-placed concrete, cement shall be Type II (low alkali) cement, meeting requirements of ASTM C-150, unless otherwise directed by the Engineer or these Specifications. Do not use cement containing lumps, or cement which has partially set. Do not mix cements originating from different sources or manufacturers.

03050.2.1.2 PRE-CAST CONCRETE - For pre-cast concrete, cement shall be Class 5000 (minimum) in accordance with ACI 318 for units to be installed above ground. For units installed below ground, concrete shall be Class 4000 in accordance with ASTM C 478 and ASTM C 858.

03050.2.2 WATER

Shall be potable or water which meets the requirements of AASHTO T-26.

03050.2.3 REINFORCEMENT

Shall be in accordance with Section 03200 of these Specifications.

03050.2.4 ADMIXTURES

03050.2.4.1 AIR ENTRAINMENT - Air entrainment of concrete shall meet the requirements of AASHTO M-154 (ASTM C-260).

03050.2.4.2 PLASTICIZERS - Water reducing agents (plasticizers) and set retarding agents shall meet the requirements of AASHTO M-194 (ASTM C-494). Only types A or F will be approved as water reducing agents and only types D or G will be approved as set retarding agents. Water reducing agents and set retarding agents shall be pre-measured and added in strict accordance with manufacturer's instructions. Calcium chloride will not be approved.

03050.2.4.3 FLY ASH - Pozzolan (fly ash) may be used to replace a percentage of cement in the mix design in accordance with ASTM C-618, under the following conditions:

- The minimum required cement content shall be expressed in the design formula before replacement calculations are made.
- The amount of Portland cement replaced by pozzolan shall not exceed 15% for exterior concrete (concrete exposed to weather) and 20% for interior concrete.
- The ratio of replacement by weight of pozzolan to cement shall be 1.25 to 1.0.
- Loss of ignition of pozzolan shall be less than 3 percent, and the water requirement shall not exceed 100 percent.
- All other requirements of this Section still apply.
- Mix designs including trial batches are required for each aggregate source and for each concrete class.
- See also Subsection 03050.2.7.4 below.

03050.2.5 AGGREGATE

03050.2.5.1 AGGREGATE RATIO - The combined weight of coarse and fine aggregate material passing the No. 200 sieve shall not exceed 1.75 percent of the total weight of aggregate. The ratio of coarse to fine aggregate shall not be less than one (1) nor more than two (2), nor shall the amount of coarse aggregate be great enough to cause difficulty in concrete placement or honeycombing in the structure.

03050.2.5.2 COARSE AGGREGATE - Coarse aggregate shall comply with AASHTO M-80, using gradations from the following table:

COARSE AGGREGATE GRADATIONS

	Percent Passing (by weight)							
	Sieve Size							
Aggregate Size	2½"	2"	1½"	1"	3/4"	½"	3/8"	No. 4
2" to No. 4	100	95-100		35-70		10-30		0-5
1½" to No. 4		100	95-100		35-70		10-30	0-5
1" to No. 4			100	95-100		25-60		0-10
3/4" to No. 4				100	90-100		20-55	0-10

Maximum coarse aggregate gradation shall not be larger than 1/5 of the narrowest dimension between sides of forms; shall not be larger than 1/3 the depth of slabs; shall not be larger than 3/4 of the minimum clear distance between reinforcing bars or between bars and forms, whichever is less; and shall not be larger than 2 inches.

The maximum percentage by weight of deleterious substances allowed in coarse aggregate materials shall be:

DELETERIOUS SUBSTANCES ALLOWED IN COARSE AGGREGATE

Substance	Percent
Soft fragments	2.0
Coal and lignite	0.3
Clay lumps	0.3
Other deleterious substances	2.0

03050.2.5.3 FINE AGGREGATE - Fine aggregate shall comply with AASHTO M-6 using gradations from the following table:

FINE AGGREGATE GRADATIONS

Sieve Size	Percent Passing (by weight)
3/8-inch	100
No. 4	95 to 100
No. 16	45 to 80
No. 50	10 to 30
No. 100	2 to 10

The maximum percentage by weight of deleterious substances allowed in fine aggregate shall be:

DELETERIOUS SUBSTANCES ALLOWED IN FINE AGGREGATE

Substance	Percent
Coal and lignite	0.3
Clay lumps	0.5
Other deleterious substances	2.0

03050.2.5.4 AGGREGATE SOUNDNESS AND REACTIVITY - As determined in accordance with ASTM C-88, potentially deleterious aggregates shall not be used unless service records have shown the aggregates to be innocuous, and the Engineer subsequently approves them in writing.

03050.2.6 MIXING REQUIREMENTS

03050.2.6.1 CONCRETE CLASSIFICATIONS - Mixing requirements for the specific concrete classes indicated on the Drawings and/or within these Specifications shall be as follows:

CONCRETE CLASSIFICATIONS

Concrete Properties	Concrete Classifications		
	5000	3500	2000
Coarse Aggregates (see requirements shown below)			
Maximum Water/Cement Ratio (gal/sack)	5.0	6.5	8.0
Minimum Cement Content (sacks/CY)	***	6.0	4.5
Slump (inches)**	2 to 4	2 to 4	2 to 5
Air Content (percent)	5.0 to 7.5	5.0 to 7.0	3.0 to 5.0
Required Average 28 Day Compression Strength Test (psi)****	5200	3700	2200
Required Minimum 28 Day Compression Strength Test (psi)****	4800	3300	1800

Notes:
* All concrete installed shall be Class 3500 unless otherwise required in the Contract Documents.
** When water reducing agents are not used.
*** Cement content shall be appropriate to produce a mixture meeting the requirements for water/cement ratio and workability for the specific job conditions.
**** One compressive strength test shall consist of the average strength of two cylinders in the test sample.

03050.2.6.2 REQUIRED AVERAGE DAY COMPRESSIVE STRENGTH - The Contractor shall furnish and install concrete that will produce a Required Average (28) Day Compressive Strength as shown on the table above. The average of any three consecutive (28) day strength tests shall not fall below the required Minimum (28) Day Compressive Strength Test shown. If the average of any three consecutive tests falls below the Required Minimum, the average strength of the concrete shall be increased at the contractor's expense by increasing the cement content.

03050.2.6.3 WATER REDUCING AGENTS - When water reducing agents (plasticizers) are used in the concrete mixtures shown above, maximum slump requirements may be increased to 5 inches with low range water reducers and to 8 inches with high-range water reducers.

03050.2.6.4 FLY ASH - When fly ash is used in the mix, the cement in the water/cement ratio denotes the cement and fly ash combined. Cement shall be introduced into the batcher before the fly ash.

03050.2.6.5 CONCRETE PLACED IN WATER - For concrete deposited in water, add one additional bag of cement per cubic yard more than the design requires for concrete placed above water.

03050.3 CONSTRUCTION REQUIREMENTS

03050.3.1 STORING CEMENT

Bagged and bulk cement shall be stored in weatherproof enclosures to exclude moisture and contaminants.

03050.3.2 STOCKPILING AND HANDLING AGGREGATE

03050.3.2.1 CLEAN SITE - The site provided for stockpiling aggregates shall be clean with adequate space to provide separate stockpiles for coarse and fine aggregates.

03050.3.2.2 WASHING AGGREGATE - Washed aggregates shall be allowed to drain to a uniform moisture content, and stockpiles shall be built at least 48 hours before use.

03050.3.2.3 HEIGHT - Aggregate shall not be dropped more than 10 feet from the conveyor, nor shall cone shaped piles more than 10 feet high be built.

03050.3.2.4 STOCKPILE LAYERING - Stockpiles shall be built in thin layers (5 feet maximum) in such manner, to prevent spillage of aggregate over the sides of the stockpile.

03050.3.2.5 FROZEN MATERIALS - Stockpiles containing snow, ice, or frozen materials shall not be used.

03050.3.3 BATCHING MATERIALS

03050.3.3.1 SCALES - The Contractor shall provide scales or arrange for usage of scales that have been certified by State agencies within the past 12 months.

03050.3.3.2 BATCH MIXERS - Batch mixers shall be operated at the manufacturer's recommended drum speed. Drums and blades shall be kept free from excessive cement and mortar build up. Cement shall be introduced into the batcher before fly ash, and all admixtures shall be introduced to the mixer separately.

03050.3.3.3 CENTRAL MIXING PLANT - At central mix plants, all materials shall be mixed for at least 80 seconds at recommended drum speed. When more water is added to the cement mixture, the materials shall be mixed for an additional 30 seconds.

03050.3.3.4 MIXING PERIOD - The mixing period for truck mixers shall be maintained between 70 and 100 revolutions at mixing speed. Maintain a minimum of 90 revolutions for front end discharge trucks. Concrete mixing shall be completed before the truck leaves the batch plant yard.

03050.3.3.5 WATER REDUCING AGENTS - If water reducing agents are added at the site, they shall be added using injection equipment capable of rapidly and uniformly distributing the admixture. Prior to discharge, the concrete shall be mixed for a minimum of 5 minutes at a drum rate not less than 12 rpm or more than 15 rpm discharge.

03050.3.4 HEATING AGGREGATE AND WATER

03050.3.4.1 HEATING EQUIPMENT - When approved by the Engineer, the Contractor, at its own expense, may provide and operate heating equipment to heat aggregate and water because of cold weather conditions. All heating operations shall meet temperature limitations provided in these Specifications and shall conform to Standard ACI 306. The Contractor shall ensure that excessive heat does not cause "flash set" when the cement is added.

03050.3.4.2 UNIFORM HEATING - Aggregates shall be heated uniformly with steam or dry heat. Water shall be heated to between 70°F and 150°F when introduced into the mixer. Measures shall be taken to prevent overheating and hot spot development. No combustion products (ash, smoke, gas and etc.) shall contact the aggregate.

03050.3.5 COOLING CONCRETE MIXTURE

03050.3.5.1 COOLING EQUIPMENT - When approved by the Engineer, the Contractor, at its own expense, may provide and operate equipment to refrigerate water, provide ice or cool aggregate, to mix concrete due to hot weather conditions. All methods of cooling shall meet the requirements of ACI 305.

03050.3.5.2 USE OF ICE - When ice is introduced into the mixer, it shall be in such form as to be completely melted and dispersed throughout the mix at the completion of the mixing time. The mixing time shall be held to the minimum practicable, consistent with producing concrete meeting the specified requirements.

03050.3.6 CONCRETE TRANSPORT

03050.3.6.1 TRUCKS - Concrete mixtures shall be transported only in conventional transit mixers or agitator trucks with rating plates that are readable. Trucks shall be equipped with visible water meters and revolution counters and shall be capable of measuring all water introduced into the mixing drum.

03050.3.6.2 LOADING - Trucks shall not be loaded:

- In excess of their rated mixing capacity, or
- In excess of 63 percent of the drum gross volume, or
- In quantities less than 2 cubic yards

03050.3.7 CONCRETE TEMPERING

03050.3.7.1 ADDING WATER – Concrete may be tempered through the addition of water under the following conditions:

- Water shall be added within specified time limits. At no time shall water be added after testing has taken place.
- Wherever possible, water shall be added after the truck leaves the batch plant.
- Water shall not be added in excess of the water/cement ratio or in excess of that specified on the batch tickets.
- The mixing drum shall be rotated at least 30 revolutions at the manufacturer's recommended mixing speed when water is added, OR, addition of water for tempering shall be followed by 3 minutes of mixing at mixing speed prior to discharge.
- Water shall not be added after 1/2 cubic yard or more of concrete has been discharged from the drum.

03050.3.7.2 LOW SLUMP - When concrete arrives at the site with a slump below specification, the Contractor may temper the mix up to the maximum approved water/cement ratio, provided:

- The mix design allows for on-site water addition;
- The amount of water added is accurately measured to the nearest gallon;
- The maximum slump is not exceeded; and
- The person adding water is approved to do so by the Engineer and the concrete supplier.

03050.3.7.3 TEMPERING WITH PLASTICIZER - Do not deliver concrete containing plasticizer to the site unless the batch delivery ticket displays water/cement ratio prior to plasticizer addition. Tempering with plasticizer after delivery time window expiration shall not be allowed.

03050.3.8 CONCRETE PLACEMENT

Shall be in accordance with Section 03300.

03050.3.9 CONCRETE SAMPLING AND TESTING

03050.3.9.1 PROCEDURE - Tests for slump, air entrainment, strength and temperature by an independent certified testing facility shall be provided by the Contractor. Independent test facility can be changed by Engineer at any time. Sampling and testing will be performed at the expense of the Contractor and as directed by the Engineer.

03050.3.9.2 SAMPLING FREQUENCY - Concrete sampling frequency shall be as noted below:

- A minimum of one air test (ASTM C-231) and one slump test (ASTM C 143) shall be performed for each placement over 5 cubic yards. At least one air and one slump test shall be performed for each additional load of concrete placed.
- For each test, the concrete temperature and the time shall be verified and recorded. Air and slump test results shall be recorded on batch delivery tickets.
- If an air test fails, immediately retest the same load. The concrete shall be rejected if the second air test fails to meet specified requirements. If the second air test meets specified requirements, a third test will be performed to establish concrete acceptance or rejection.
- If the slump for an individual load cannot be corrected by tempering within the mix design requirements and within the requirements of these Specifications, the load shall be rejected.
- The testing facility shall prepare test cylinders for strength testing in accordance with ASTM C-31 & ASTM C-39.
- At least one strength test shall be performed for each placement over 5 cu. yd., and one additional test for every 50 cu. yards of concrete placed or more frequently at the Engineer's discretion. Three cylinders shall be prepared for each test. One cylinder from each test may be set aside at the Contractor's request for strength verification prior to form removal. The average compressive strength of two cylinders constitutes one compressive strength test.
- The Contractor shall provide space in the work area and protect sample cylinders from disturbance for 24 hours after they are cast or until they are moved from the work area by testing laboratory personnel or under the direction of the Engineer.
- The average compressive strength shall meet the requirements shown in the table in Section 03050.3.1 for the class of concrete placed.

03050.4 METHOD OF MEASUREMENT

Measurement for concrete placed in accordance with these Specifications shall be as described in Section 03300.

03050.5 BASIS OF PAYMENT

Acceptable quantities of concrete, when measured separately, shall be paid for at the contract unit prices described in Section 03300.

SPECIAL PROVISION

CONCRETE	**SECTION 03051SP**

Add the following subparagraph to specification 03050:

MIX DESIGN

A. Selection of Cement:

1. Concrete used for the this project shall be 4500 Class Concrete conforming to the following specification:

Concrete Properties	Concrete Classification
	4500
Coarse Aggregates (see requirements shown below)	
Maximum Water/Cement Ratio***	0.45
Slump (inches)**	2.0 to 4.0
Air Content (percent)	5.0 to 7.0
Required Average 28 Day Compression Strength Test (psi)****	4700
Required Minimum 28 Day Compression Strength Test (psi)****	4300

Notes:
* All concrete installed shall be f'c 4500 unless otherwise required in the Contract Documents.
** When water reducing agents are not used.
*** Cement content shall be appropriate to produce a mixture meeting the requirements for water/cement ratio and workability for the specific job conditions.
**** One strength test shall be the average of the strengths of at least two 6x12 in. cylinders or at least three 4x8 in. cylinders made from the same sample of concrete and tested at 28 days or at test age designated for f'c. (ACI 318-14 26.12.1.1)

END OF SECTION

03100.1 DESCRIPTION

Includes furnishing materials, accessories and labor required to form, finish and cure interior and exterior cast-in-place concrete.

03100.1.1RELATED WORK

Section 03050 - Portland Cement Concrete
Section 03200 - Concrete Reinforcement
Section 03300 - Concrete Structures and Slabwork
Section 03500 - Precast Concrete Components
Section 03600 - Grout and Mortar

03100.1.2SUBMITTALS

03100.1.2.1 SHOP DRAWINGS - When called for in these Specifications, the Contractor shall furnish shop drawings of forms for specific concrete items. Such drawings shall show general construction of forms, jointing, location of ties and other items affecting visibility.

03100.1.2.2 FORM RELEASE AGENT - Where concrete surfaces are scheduled to receive special finishes or applied coverings, which may be affected by the form release agent, submit manufacturer's instruction for use of agent.

03100.1.2.3 CHEMICAL HARDENER - Submit name, type, chemical analysis and manufacturer's recommended rate of application for chemical hardener, when specified.

03100.1.2.4 CURING COMPOUNDS - Submit manufacturer’s specifications, test information, ingredients, certification, and installation recommendations for curing compounds. This information may become the basis of acceptance or rejection of the work cured by the material used. See also the submittal requirement under Membrane Curing Compounds in 03100.3.6.2 herein

03100.1.3DEFINITIONS

Shoring - The framework installed to support formwork.

Re-Shoring - Framework installed or not removed which serves as support for form-work after concrete sets and there is less need for the support.

Form Coatings - Compound coated on forms, preventing concrete surface bonding to the forms.

Curing Compound - Liquid medium sprayed or coated on concrete to retain moisture.

03100.2 MATERIALS

03100.2.1FORM TIES AND SPREADERS

Shall be removable or snap-off metal, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal. Form ties shall be factory fabricated. Field fabricated ties will not be acceptable. The portion of the tie remaining within concrete after removal of exterior parts should be 1 inch below the outer concrete surface, and the remaining hole in the concrete surface shall not be larger than 1 inch diameter, unless approved otherwise by the Engineer.

03100.2.2JOINT FILLER

Shall be furnished and installed in accordance with Section 03310 herein.

03100.2.3FORM RELEASE AGENTS

Commercial formulation form release agent compounds shall be used. Form release agents shall not bond with, stain or adversely affect concrete surfaces requiring later bond or adhesion. They shall not impede the wetting of surfaces to be cured with water or curing compounds. Surplus oil on forms and form oil on reinforcing steel and construction joints shall be removed before concrete is placed.

03100.2.4FILLETS FOR CHAMFERED CORNERS

Shall be wood strips 3/4 inch by 3/4-inch size and of maximum possible length.

03100.2.5MORTAR AND GROUT

Shall be furnished in accordance with Section 03600 herein.

03100.2.6LIQUID CHEMICAL HARDENER

Shall be a colorless aqueous solution, containing a blend of magnesium fluosilicate, zinc fluosilicate and a wetting agent. The mixture shall contain not less than 2 pounds fluosilicate per gallon and shall not interfere with adhesives and the bonding of finishes where such is indicated.

03100.2.7WATER

Water for curing shall meet the requirements of Section 03050 herein.

03100.2.8MOISTURE RETAINING SHEETING

Shall be white, waterproof paper, polyethylene film or burlap-polyethylene sheet which meets the requirements of ASTM C-171.

03100.2.9MOISTURE ABSORPTIVE COVER MAT

Shall be clean cotton or burlap fabric roll goods.

03100.2.10 CURING COMPOUND

Shall be a clear type with fugitive dye conforming to ASTM C-309, Type 1, unless otherwise approved by the Engineer. **CAUTION!!** The method of application of curing compound specified herein requires more product than is normally suggested by the manufacturer and that is customary in the trade. The amounts specified herein shall be applied, regardless of manufacturer's recommendation or customary practice.

03100.3 CONSTRUCTION REQUIREMENTS

03100.3.1SITE CONDITIONS

The Contractor shall examine the condition of the area on which forms are to be installed and conditions under which the work of this Section is to be performed, and shall correct unsatisfactory conditions which would prevent proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

03100.3.2DESIGN OF FORM-WORK

03100.3.2.1 LOADING - Form-work shall be designed to safely support all vertical and lateral loads that may be induced by wet concrete both during the placement and afterward, until such loads can be supported by the structure itself as the concrete sets and begins to cure. Forms and falsework shall be designed to include assumed values of live load, dead load, weight of moving equipment to be operated on form-work, concrete mix, height of concrete drop, vibrator frequency, ambient temperatures, foundation pressures, stresses, lateral stability and other factors pertinent to the safety of the structure during construction.

In form-work design, provide for all openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screed, bulkheads, anchorage, inserts and other features as required on the Drawings.

03100.3.2.2 TOLERANCES – Form-work design shall call out material and components of sufficient strength, thickness, number of ties, amount of bracing, etc., to withstand the pressure of newly placed concrete without bow or deflection.

03100.3.3FORM-WORK CONSTRUCTION

03100.3.3.1 COMPLIANCE – Form-work shall be constructed in compliance with ACI 347, to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grade, and level and plumb work in finished structures.

03100.3.3.2 MATERIALS – Form-work shall be constructed from steel, steel reinforced panels, smooth grade plywood, or other materials which may be approved by the Engineer or shown on the Contract Documents for special purposes. Plywood material with raised grain, patches, or other defects that will mar the finished surface of the concrete surface shall not be used.

03100.3.3.3 ERECTION - Form facing materials shall be erected, supported, braced and maintained by structural members spaced to prevent deflection. Form-work shall be tight, to prevent leakage of cement paste during concrete placement. Joints shall be solidly butted together and backed up as required to prevent leakage and fins. Forms placed in successive units for continuous surfaces shall be fitted to provide accurate alignment, free from irregularities, and within allowable tolerances. Use selected materials to obtain required finishes.

Provide for all openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screed, bulkheads, anchorage, inserts and other features required. Accurately place and securely support items to be built into forms. Provide formed openings for elements to be embedded in or pass through the concrete. Install accessories in accordance with manufacturer's instructions and ensure items are not disturbed during concrete placement. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Bevel wood inserts for forming keyways, reglets, recesses and the like, to prevent swelling and assure ease of removal

Form-work shall accommodate the work of all other trades where materials and products must be purchased and fabricated before the opportunity exists to verify the measurements of the adjacent construction affecting their installations. Verify size and location of all openings, recesses and chases with the trade requiring such items, and ensure that forms for openings and construction which accommodate installation by other trades, be accurately sized and located as dimensioned on the Drawings.

03100.3.3.4 FORM RELEASE AGENT - Coat form/concrete contact surfaces with form coating compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions.

03100.3.3.5 CLEANING - Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before concrete is placed.

03100.3.3.6 TOLERANCES – The Engineer recognizes that, given the realities of the physical world, there are times when formwork for concrete cannot be constructed closely enough to yield zero tolerances in the finished work. Therefore, the following tolerances are allowed but shall not be exceeded:

- In general, deviation in alignment of slabs and walls shall not exceed ¼ inch in the horizontal or vertical dimensions of a pour. All slabs which are indicated to be level shall have a maximum deviation of 1/8 inch in 10 feet without any apparent change in grade.

- The maximum tolerance from true level and plumb throughout the entire length and/or height of a structure shall be +/- ¼ inch and without any abrupt changes from one part of the pour to another.

- Form-work construction for circular structures shall be allowed a maximum deviation in the arc of ¼ inch in each 10 feet of radius; therefor, as an example, a tank with a 50 foot radius shall be allowed a maximum deviation of 1-1/4 inch from the center of the tank to the arc of the wall. In circular construction, the Contractor also is allowed to deviate from the finish line shown on the Drawings through the use of form panels, which will give chord lengths not to exceed 2 feet.

In the event that deviation from the Drawing dimensions results in problems in the field, the Contractor shall be responsible for resolution of the conditions, as approved by the Engineer, without additional expense to the Owner.

03100.3.4REMOVAL OF FORMS

03100.3.4.1 CONSIDERATIONS ASSOCIATED WITH FORM REMOVAL - Forms shall be removed in a manner to insure complete safety of the structure. Forms shall not be removed until concrete has sufficient strength to carry its own weight and the loads upon it with safety. Do not pry against face of concrete; use only wooden wedges.

03100.3.4.2 MINIMUM ELAPSED TIME - Forms shall not be removed sooner than the minimum elapsed times given in the following schedule unless allowed otherwise in the Contract Documents or as directed by the Engineer.

When directed by the Engineer, because of weather conditions or for other reasons, the forms shall remain in place for longer periods than stated below. The periods of time for form removal set forth below are minimums with no allowances for external loading. The periods of time set forth below are permissive only and do not relieve the Contractor from responsibility for risks associated with form removal.

MINIMUM ELAPSED TIME

Structural Component	**Over 50°F**	**Between 40° and 50°F**

Walls and perimeter forms at slab on grade panels	2 days	3 days
Underside of slabs		
Side forms of beams	10 days	14 days
Underside of beams	2 days	3 days
Stairways	10 days	14 days
	10 days	14 days

The time periods shown above are based on concrete materials being mixed and placed in accordance with these Specifications. When high early strength inducing admixtures are used in concrete, the Engineer may permit form removal after shorter times than those shown in the table. Form removal time also may be reduced if test cylinders of concrete, field cured along with the concrete they represent, have reached the strength specified in Paragraph 03050.3.1 of Section 03050 – Portland Cement Concrete.

03100.3.4.3 RE-SHORING - Where no re-shoring is planned, leave forms and shoring used to support weight of concrete in beams, slabs and other concrete members in place until concrete has attained its specified strength. Where re-shoring is planned, supporting form-work may be removed when concrete has reached 70 percent of specified strength, provided re-shoring is installed immediately.

Place re-shores as soon as practical after stripping operations are complete, but in no case later than the end of the working day on which stripping occurs. During re-shoring, do not subject concrete in beam, slab, column or any other structural member to combined dead, construction, and live loads in excess of loads permitted for developed concrete strength at time of re-shoring. Tighten re-shores to carry required loads without over stressing.

Re-shores shall remain in place until the supported concrete has reached its specified strength.

03100.3.5CONCRETE FINISHING

03100.3.5.1 FINISHING FORMED SURFACES - Within 72 hours after forms are removed, the Contractor shall finish exposed surfaces in accordance with one of the procedures described below. Where no finish requirement is provided on the Drawings, formed concrete surfaces exposed to view and surfaces designated to receive paint shall be given a "Smooth" finish and slabs shall be given a "Trowel" finish. When workmanship is less than the acceptable standard, provide one of the rubbed finishes at no additional cost to Owner.

- F1 - As Cast Form Finish - No finish.
- F2 - Rough Finish - Patch defects and chip or rub off fins exceeding 0.33 inch height.
- F3 - Smooth Finish - In addition to the rough finish requirements, patch tie holes and defects and remove fins completely. When surface texture is impaired and form joints misaligned, grind, bush-hammer or correct such areas. Slurry grout areas evidencing minor mortar leakage to match adjacent concrete. Repair major mortar leakage as a defective area.
- F4 - Smooth Rubbed Finish - Remove forms and perform necessary patching as soon after placement as possible. Finish newly hardened concrete no later than 24 hours following form removal. Perform a smooth finish, then wet surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced.
- F5 - Grout Cleaned Rubbed Finish - Undertake this operation after all contiguous surfaces are completed and accessible. Perform a smooth finish, then brush blast with abrasive basting to open surface pores. Wet surface of concrete sufficiently to prevent absorption of water from grout. Mix grout in accordance with Section 03600 and rub a uniform coat over surface to be

finished. Immediately after grouting, scrub surface with cork float or stone to coat surface and fill voids. While grout is still plastic, remove excess grout by working surface with rubber float or sack. After surface whitens from drying, rub vigorously with clean burlap. Keep damp for at least 36 hours after final rubbing.

- F6 - Cork Floated Rubbed Finish - Remove forms within 2 to 3 days of placement where possible. Perform a smooth finish and then dampen wall surface. Mix mortar in accordance with Section 03600, and apply with firm rubber float or with trowel, filling all surface voids and compress mortar into voids. If mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with fog sprayer. Produce a final texture with a cork float using a swirling motion.

- F7 - Unformed Finish - After concrete is placed, strike smooth, tops of walls or buttresses, horizontal offsets and similar unformed surface occurring adjacent to formed surfaces. Float to texture which is reasonably consistent with formed surface. Continue final treatment on formed surfaces uniformly across unformed surfaces.

- F8 - Blasted Finish - Complete a smooth finish then perform abrasive blasting within 24 to 72 hours after casting. Coordinate with form-work construction, concrete placement schedule and form-work removal to ensure that surfaces are blasted at the same age for uniform results. Reapply curing protection after blast finishing.

- F9 - Architectural Finish - Finish in accordance with ACI 303.

- F10 - Tooled Finish - Dress thoroughly cured concrete surface with electric, air or hand tools to uniform texture, and give a bush hammered surface texture. Remove sufficient mortar to exposed coarse aggregate in relief and to fracture coarse aggregate for tooled finish.

03100.3.5.2 REPAIRING FORMED CONCRETE SURFACES - When the Drawings indicate repairs are required or when the Engineer determines areas are defective and require repair, the following procedure shall be taken to make repairs:

- Remove defective concrete to sound concrete and make edges perpendicular to surface or slightly undercut. Feathered edges are not permitted.

- Dampen area to be patched and at least 6 inches surrounding it.

- Prepare bonding grout by mixing to consistency of thick cream and brush into surface.

- Tie holes shall be cleaned, thoroughly dampened, and filled solid with patching mortar.

- Make any patches in concrete to closely match color and texture of surrounding surfaces. Determine mix formula for patching mortar by trial to obtain a good color match with concrete when both patch and concrete are cured and dry.

- Mix white and gray Portland cement as required to match surrounding concrete to produce grout having consistency of thick paint. Use a minimum amount of mixing water.

- Mix patching mortar in advance and allow to stand, without addition of water, and without frequent manipulation, until it has reached a stiff consistency. After surface water has evaporated from patch area, brush bond coat into surface. When bond coat begins to lose water sheen, apply patching mortar. Thoroughly consolidate mortar into place and strike-off to leave patch slightly higher than surrounding surface. Leave undisturbed for at least 1 hour before final finish. Keep patched area damp for 72 hours or apply curing compound.

- Do not use metal tools in finishing an exposed patch.

- Where as cast finishes are indicated, total patched area may not exceed 1 in 500 of as cast surface. This is in addition to form tie patches, if ties are permitted to fall within as cast areas.

- In any finishing process which is intended to expose aggregate on surface, patched areas must show aggregate. Outer 1-inch of patch shall contain same aggregates as surrounding concrete. After curing, expose aggregates together with aggregates of adjoining surfaces by same process.

03100.3.5.3 FINISHING SLAB SURFACES - In no case shall water be added to the surface (i.e., by sprinkling) to finish. Slab surfaces shall receive one of the following finish treatments as indicated on the Drawings:

- S1 - Floated Finish - After concrete has been placed, consolidated, struck-off and leveled, do not work further until ready for floating. Begin floating when water sheen has disappeared and surface has stiffness sufficient to permit operation. During or after first floating, check plainness of entire surface with a 10 foot long straightedge applied at 2 or more different angles. Cut down high spots and fill low spots to the required tolerance. Re-float slab immediately to a uniform sandy texture.

- S2 - Trowel Finish - Float finish the surface. Power trowel or hand trowel as required to provide a uniform surface. Do not apply (i.e. sprinkle) water or dry cement to surface of concrete when finishing. First troweling after floating shall produce smooth surface relatively free of defects, but may still show some trowel marks. Second trowel by hand after surface has hardened. Leave finished surface essentially free of trowel marks, uniform in texture and appearance. On surfaces intended to support floor coverings, grind off defects which would show through floor coverings.

- S3 - Broom Finish – Trowel finish the surface. Power trowel or hand trowel as required to provide uniform surface. Lightly brush surface parallel to direction of drainage with a hair broom. Coarseness of broom bristle may be varied slightly, to achieve desired degree of surface roughness.

- S4 - Exposed Aggregate Finish - Immediately after surface of concrete has been leveled to tolerance and surface water has dissipated, spread aggregate uniformly over surface to provide complete coverage to the depth of a single stone. Embed aggregate into surface by light tamping. Float surface until embedded aggregate is fully coated with mortar and surface has been brought to tolerance. Start exposure of aggregate after matrix has hardened sufficiently to prevent dislodgement. Flow ample quantities of water, without force, over surface of concrete while matrix encasing aggregate is removed by brushing with a fine bristle brush. Continue until aggregate is uniformly exposed. An approved chemical retarder sprayed onto freshly floated surface may be used to extend working time.

- S5 - Chemical Hardener Finish - Apply liquid chemical hardener finish to interior concrete floors where indicated. Do not apply liquid chemical concrete hardener on floor areas scheduled to receive synthetic matrice terrazzo, setting beds for tile, terrazzo, vinyl flooring or like items. Apply hardener after complete curing and drying of concrete surface in accordance with manufacturer's recommendations. Evenly apply each coat and allow 24 hours for drying between coats. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

03100.3.6CONCRETE CURING

03100.3.6.1 SURFACES WITH UNREMOVED FORMS - When forms are left in place (i.e., underside of beams, etc.) the Contractor shall proceed with curing adjacent surfaces without regard to the formed surfaces. When such forms are removed, curing shall then proceed over the entire surface.

03100.3.6.2 CURING CONDITIONS - Immediately after finishing of concrete surfaces (formed or slab) the Contractor shall verify concrete surfaces are ready for curing. The Contractor shall correct any conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected. A minimum ambient temperature of not less than 40° shall be maintained for at least 7 days during concrete curing. Concrete shall then be cured by one of the following methods:

- Moisture Cover - Water or continuous water-fog spray shall be applied, or the concrete surface shall be covered with water saturated absorptive mat kept continuously soaked, for not less than 7 days and nights.

- Moisture Retaining Sheet - Place cover in widest practicable width with sides and ends lapped and sealed to prevent moisture loss for a period of not less than 7 days and nights. All holes or tears in the cover sheet shall be kept repaired during the curing period.

- Membrane Curing Compound – All required repairs, patching, and final finishing operations shall be completed prior to application. Curing compound shall be applied as soon as the concrete is firm enough to work on. Slab surfaces shall be coated with curing compound within one hour after form removal; if more than one hour has elapsed, the surface shall be water cured.

  The compound shall be thoroughly mixed and a minimum of two coats shall be applied, with each coat applied in a direction different from that used for the preceding coat. The surface shall be coated and re-coated in a continuous operation until the surface has a uniform appearance; is effectively and completely sealed; and until a coating film remains on the surface of the concrete that can be scraped from the surface at any and all points after drying for at least 24 hours. Continuity of the coating shall be maintained, and all damage to the curing compound membrane shall be repaired, during the specified cure period.

  Curing compound shall not be allowed within the silhouette of any construction joint. If any curing compound enters the construction joint, the joint shall be sandblasted prior to placing any new concrete.

  Curing compound shall not be used on surfaces to be painted or coated.
  Surfaces intended to contain potable water (tank interiors, etc.) shall not be cured with curing compounds.

  Curing compound shall not be removed in less than 7 days from the time of application without written approval from the Engineer. When approved and prior to such removal, the Contractor shall provide a detailed plan for adequately curing the concrete.

03100.4 METHOD OF MEASUREMENT

Unless otherwise noted in the Special Provisions, separate measurement will not be made for concrete included as components of items shown in the Bid Schedule. Separate measurement for formed concrete and slabs shall be in accordance with the requirements of Section 03300.

03100.5 BASIS OF PAYMENT

Unless otherwise noted in the Special Provisions, no separate payment will be made for concrete included as components of items shown in the Bid Schedule. Separate payment for formed concrete and slabs shall be in accordance with the requirements of Section 03300.

CONCRETE TANKS (CLARIFIERS & DIGESTERS) SECTION 03110SP

Part 1 GENERAL

1.1 DESCRIPTION

1.1.1 The Contractor shall furnish all labor, equipment, materials, and components to construct and erect a concrete water storage tank as shown on the DRAWINGS, consisting of a concrete roof, concrete floor and a cast-in-place concrete wall. The tank shall conform to the dimensions and be equipped with the appurtenances, valves and piping within the pay limits for the tank, as shown on the DRAWINGS and in accordance with these SPECIFICATIONS.

1.2 RELATED WORK

Section 02105 – Earthwork Materials
Section 02200 – Trench Excavation and Backfill
Section 02201 – Earthwork for Structures
Section 02222 – Water Pipe Installation
Section 03050 – Portland Cement Concrete
Section 03100 – Concrete Forming, Finishing and Curing
Section 03200 – Concrete Reinforcement
Section 03300 – Concrete Structures and Slabwork
Section 03310 – Concrete Joints for Slabwork
Section 15110 – Pipe and Piping Systems
Section 15230 – Waterline Valves and Hydrants
Section 15232 – Water System Control Valves
Section 16010 – Electrical
Section 17000SP – Instrumentation

1.3 SUBMITTALS

1.3.1 Descriptive literature, which identifies the manufacturer and materials used for fabrication for all piping, valves, fittings, control valves, water stops, liners and appurtenances, shall be provided by the Contractor in accordance with Section 01300 of these SPECIFICATIONS.

1.3.2 The Contractor shall submit a 2-foot minimum length of each type of closed cell neoprene pad for the tank lid joint and of the water stop material for inspection and acceptance testing, to ensure compliance with the requirements of these SPECIFICATIONS.

1.3.3 The Contractor shall submit concrete mix design information along with certified strength test documentation for that design for approval by the Engineer at least two weeks prior to planned concrete placement.

1.3.4 The Contractor shall submit test documentation required for culinary water systems for all tests and disinfection activities performed on the tank and its associated piping in accordance with the Standard Specifications (See Section 02222.3).

1.3.5 Submit for acceptance the proposed repair methods, materials, and modification need to assure that the work will meet tightness requirements of contract documents.

1.3.6 test reports provided by the Contractor shall include the results of tightness testing performed during the course of the work and shall be submitted to the Architect/Engineer. Test reports shall include test location in the containment structure, dates of testing, water level measurement, amounts of precipitation or evaporation (when applicable), measured temperatures and volume corrections (if any), retest results, corrective actions taken if any, and final results. Final reports shall be provided within 7 days of test completion.

1.4 QUALITY ASSURANCE

1.4.1 Unless otherwise specified in the contract documents, the Contractor shall prepare and fill the containment structure and provide access and equipment, make the measurements, and observations for the required testing. The Architect/Engineer shall have access to observe measurements and witness observations included in the test reports, for verification.

PART 2 MATERIALS

2.1 CONCRETE, CONCRETE REINFORCING STEEL, AND REINFORCEMENT SUPPORTS

2.1.1 Concrete shall be furnished in accordance with Section 03050 of the Standard Specifications. Xypex®, Kryton®, or approved equal crystalline waterproofing admixture shall be included in the final concrete mix design for all concrete in the culinary water storage tank. The Contractor shall furnish a qualified factory representative to direct addition of the admixture at the batch plant. The admixture shall meet the factory recommended concentration. The Contractor shall be aware that the admixture may affect curing time for finishing.

2.1.2 Concrete forms for use in tank construction shall be steel, clean, and in very good condition.

2.1.3 Reinforcing steel shall comply with Standard Specifications Section 3200 with the following exceptions. Concrete reinforcement bar supports for this tank shall conform to ACI 315, and shall consist of stainless steel chairs, plastic spacers and/or plastic shim plates.

The stainless steel chairs shall be furnished with plastic tips where supports legs are in contact with forms on concrete surfaces exposed to view.

The plastic spacers shall be Preco Barspan Wheels, as manufactured by Preco Corporation (phone 1-800-645-1258) or approved equal

Plastic shim plates may be used to support plastic spacers and shall be used to support vertical reinforcing in the core-wall for the tank, unless shown otherwise on the DRAWINGS.

2.2 WATER STOPS

2.2.1 Water stops shall be ribbed, having a hollow center bulb cross-section and they shall uniform in dimensions and as detailed on the Drawings. Water stops shall be free of porosity and shall be made of a dense, homogeneous, virgin PVC compound. No reclaimed PVC shall be used in the compound. Water stops shall be by Vinylex Corporation, 2636 Byington-Solway Road, Knoxville, TN 37921 (ph. 615-690-2211), Greenstreak Plastic Products, Box 7139, St. Louis, MO 63177 (ph. 314-225-9400), or approved equal. Water stops shall meet the minimum material requirements of the table below.

WATER STOP MATERIAL SPECIFICATIONS		
Tensile Strength	2,000 PSI	(ASTM D-412)
Ultimate Elongation	350%	(ASTM D-412)
Shore Hardness	75 $\pm$ 5	(ASTM D-2240)
Specific Gravity	1.3	(ASTM D-792)
Stiffness in Flexure	600 PSI	(ASTM D-747)
Cold Brittleness	-35°F	(ASTM D-746)
Water Absorption: 48 Hours	0.320% (Max.)	(ASTM D-570)
Tear Resistance	290 pounds/inch	(ASTM D-624)

2.2.2 Water stops shall be installed in the joints designated on the DRAWINGS, with precautions taken to ensure proper location, support, and protection of the water stop during concrete placement.

Water stops shall be correctly positioned and held in place within the forms by using split forms, or other approved method that will positively hold the water stop in the correct position and alignment, so that the center of the water stop is centered on the joint. Horizontal water stops shall be bent up during concrete placement, until the concrete has been brought to the level of the water stop; additional concrete shall then be placed over the water stop, after which the concrete shall be thoroughly vibrated.

2.2.3 All water stops shall be tied off in two directions every 12 inches in such a manner that bending over one way or another is prevented. In cases where preformed expansion joint material is used in conjunction with the water stop, allowance shall be made for equal water stop embedment on each side in the concrete. A hog ring or a nail may be driven through both outside ends of the water stop (within ½" of the outside edge) to facilitate placement and/or tying of water stops to reinforcing steel, forms, or form-ties.

2.2.4 All water stops shall be properly spliced and joints shall be checked for strength and pinholes after splicing. Splices shall be strong enough to develop a pulling force of 75

percent of the strength of the water stop, and shall be watertight. The Contractor shall connect the ends of the radial water stop in the wall-footing joints to the circumferential water stop in the wall to wall-footing joint and to the circumferential water stops in the floor to wall-footing joints if they should exist.

2.3 MISCELLANEOUS COMPONENTS AND APPURTENANCES

2.3.4 The tank access roof hatch shall be by Halliday, or approved equal, with a fully enclosed curb and stainless steel hardware, of the type and size specified on the DRAWINGS. It shall be sealed to the tank access curb through the use of a caulked neoprene gasket and shall be fastened to the tank by means of 3/8" x 4" long stainless steel expansion anchors at each corner and spaced at 8 inches on center maximum around the flange of the hatch. The method of closure and closing hardware shall meet requirements of the Utah State Department of Public Drinking Water. See Section 08121SP of these SPECIFICATIONS.

2.3.5 The air vents shall consist of a 6-inch diameter hot dip galvanized steel pipe fabricated as shown on the Drawings. The vent shall be provided with a ring seal embedded in the tank roof slab and a # 14 (1.4 mm) stainless steel screen installed as shown on the drawing details.

2.3.6 Tank ladders shall be fabricated of stainless steel as shown on the DRAWINGS. All bolts and connectors shall be stainless steel.

2.3.7 Brackets and bands, which support and stabilize the interior piping, shall be fabricated from stainless steel as shown on the DRAWINGS, and all bolts and fasteners shall be stainless steel.

2.3.8 Pipe and fittings embedded in concrete the tank shall be ductile iron with mechanical or flanged joints, meeting the requirements of Section 2222 of the Standard Specifications. The overflow stand pipe may be AWWA C900 PVC with ductile iron fittings. All joints shall be fastened with stainless steel bolts and hardware. The overflow funnel shall be fabricated of 1/8" minimum thickness 304 or 316 stainless steel and shall snuggly fit the bell joint and gasket of the receiving pipe. A stainless steel pipe support bracket shall directly support the straight pipe section of the funnel above the point where it is inserted in the pipe bell. All joints on the overflow pipe and the funnel assembly shall be water tight. Pipe and fittings outside of the tank shall also meet the requirements of Section 2222 of the Standard Specifications and shall be of the material and in the configuration shown on the DRAWINGS.

2.3.9 All valves, valve boxes and enclosures shall be furnished and assembled in accordance with the DRAWINGS, Standard Specifications, and Special Provisions as applicable.

2.4 NSF COMPLIANCE

2.4.4 All materials, which will be in contact with culinary water after construction is completed and the tank is placed in service, including ladders into tanks and other components shall comply with National Sanitary Foundation (NSF) Standard 61.

PART 3 EXECUTION

3.1 EARTHWORK

2.4.5 Earthwork shall be accomplished in accordance with Section 2201 of these SPECIFICATIONS, and as noted below.

2.4.6 Unless directed otherwise by the Engineer, the entire site falling within the tank structural area shall be excavated to the lowest subgrade elevation, or to non-expansive bedrock, whichever is deeper, unless otherwise directed by the Engineer.

If site conditions are found to be different than expected (based on the geotechnical report), additional excavation may be required to provide adequate structural integrity for the tank. In lieu of or in addition to additional excavation, the Engineer may require the use of lean concrete as fill or foundation material for the tank. Additional requirements made by the Engineer as outlined in this paragraph shall constitute a changed condition, and the Contractor shall be compensated in accordance with Section 13 of the General Conditions.

2.4.7 After preparation of the subgrade in accordance with Paragraph 2201.3.7 of the Standard Specifications, the Contractor shall place untreated base course material, in accordance with Section 02105, for the floor slab and tank footings as shown on the DRAWINGS. This material shall be placed in loose lifts not to exceed 6 inches and then compacted in accordance with Paragraph 2201.3.9 to 95% of maximum density. The finished thickness of the material shall be as shown on the DRAWINGS.

2.4.8 Compaction required for all subgrade and earthwork materials used in tank construction, within the tank structural area, shall be 95% of maximum density unless directed otherwise by the Engineer. The tank structural area shall be that portion of the subgrade under the tank and 5 feet outside of the tank footing radius, unless otherwise shown on the DRAWINGS. Particular attention should be paid to compaction around footings. All compaction and testing shall be accomplished in accordance with Section 2201 of these SPECIFICATIONS.

2.4.9 Unless directed otherwise by the Engineer, tank sites on hill slopes, on which embankment fills are to be placed, shall be terraced in a manner that all cuts are in bedrock or on subgrade materials approved by the Engineer. The “terracing” of slopes shall consist of near horizontal benches at least 4 feet wide and spaced vertically at a maximum of 2 feet intervals. The near horizontal benches shall be sloped 1.5 percent to provide natural drainage away from the slopes.

2.4.10 The finished subgrade and grade of the gravel fill under the floor and footings shall not vary more than minus 0.05 feet and plus 0.00 feet from the established grades and cross-sections shown on the DRAWINGS.

2.4.11 After pipe blocks have been formed and constructed and the forms for the pipe blocks have been removed, the areas under floor and footings and around pipe blocks that

require structural granular fill shall be built up in 6 inch loose lifts. This material shall be compacted in accordance with the Standard Specifications until the finished elevations, shown on the DRAWINGS, have been reached.

In lieu of forming the pipe blocks, the structural granular fill may be completed to the required finished elevation after which the pipe blocks may be excavated. However, any loose or disturbed soil must be removed from the excavated areas and the compaction in the excavated areas must be rechecked for the required 95 percent minimum relative compaction under the supervision of a competent soils engineer.

2.4.9 If excavation of the subgrade is in rock, any over-blasted or unsuitable material under the tank shall be removed. Unless otherwise directed by the Engineer, all over-blasted or over-excavated material shall be replaced with a lean concrete mix as defined below. When directed by the Engineer, lean concrete shall also be used to level the site and create the required slope to the outer perimeter ring drain, as applicable.

Lean concrete mix shall be prepared in accordance with requirements of Section 03050 for Portland cement concrete, but the mix shall use 3-sacks of Portland cement per yard of concrete mix. Lean concrete shall obtain a minimum compressive strength of 700 psi after 7 days when tested in accordance with Section 3050 of these SPECIFICATIONS.

2.4.10 Backfill shall not be commenced until leakage testing has been satisfactorily completed. Backfill shall be accomplished in accordance with Section 2201, except as noted.

As applicable, the Contractor shall take every precaution to avoid damaging or puncturing the prefabricated drainage composites or tank cover coating during back filling and compaction operations. Prefabricated drainage panels shall be adequately sealed at the top to prevent debris and dirt from entering behind the backfill material.

Only lightweight hand operated compaction equipment shall be employed within 3 feet of the tank wall. This requirement will help to avoid any possibility that excessive pressure will develop on the walls, which could cause the structure to fracture. Compaction lifts shall be no thicker than can be properly compacted with the equipment used. The minimum compaction density for each lift shall be 90% at optimum moisture content for the full depth of the fill.

3.2 CONCRETE

3.2.1 Concrete work shall conform to the concrete notes and requirements as shown on the plans and with the provisions of Division 03000 of the Standard Specifications as supplemented and modified by this Section. Concrete forms, reinforcement, concrete and tank appurtenances shall be located and placed as shown on the Drawings, and in accordance with the notes and requirements on the plans and Division 03000 of the Standard Specifications, unless noted otherwise herein.

3.2.2 <u>The proposed concrete mix design shall be submitted to the Engineer for review a minimum of two weeks in advance of the first planned concrete placement along with</u>

certified compression test results for that mix design. No concrete for the tank may be placed until the Engineer has approved the mix design.

3.3 TANK WALL TOP JOINT (FOR TANKS WITH ROOFS ONLY)

3.4.1 Neoprene bearing pads shall be of the dimensions and hardness shown on the Drawings, and shall be manufactured by an approved manufacturer. Unless otherwise specified on the Drawings, neoprene bearing pads shall be of 40 durometer and the material shall conform to ASTM D-2000 M2BC414A14C12F17. Where specified, material for 30 durometer neoprene pads shall conform to ASTM D-2000 M2BC310A14C12F17. Kirkhill Rubber Co., 300 East Cypress Street, Brea, CA 92621 (phone 714-529-4901, Construction Products Dept.) is one of several suppliers who can furnish neoprene pads meeting these requirements. Approved equal materials may be used.

3.3.2 Closed cell neoprene pads shall be used as a filler material in the flexible joint between the wall and roof connection in the areas not taken up by the solid neoprene bearing pads. Closed cell neoprene shall be ordered at least 1/4 inch wider than theoretically required, to facilitate placing and to reduce development of voids between filler pads, bearing pads and water stops. The material shall be medium grade closed cell neoprene conforming to 2A3 of ASTM D-1056-85 and as further specified in the table below and on the Drawings. (Note: Rubatex R431N or R423N, or approved equal, are acceptable materials)

CLOSED CELL NEOPRENE PAD SPECIFICATIONS	
Compression Deflection	9 - 13 PSI
Shore 00 Durometer	60 - 80 PCF
Density	12 - PCF
Water Absorption By Weight	5%
Temperature Range:	
Low (Flex Without Cracking)	-30°F
High Continuous	150°F
High Intermittent	200°F
Heat Aging (7 days @ 158°F) Lineal Shrinkage (Max.)	5%
Tensile Strength	115 PSI (Min.)
Elongation	180% (Min.)
Resilience (Bayshore-% Rebound Average 1/2 inch Thickness at 72 °F	20% - 40%

3.3.3 All voids around bearing pads and cavities between bearing and filler pads whether these voids and cavities are large or small, shall be filled with soft mastic. The mastic material shall be installed at a consistency that will not adversely affect the quality of PVC and neoprene materials. The Contractor's workmanship shall be such that no

cement grout or concrete seepage will occur through the bearing and filler pad areas. SIKAFLEX 1A, as manufactured by Sika Corporation or SELECT SEAL U-230, as manufactured by Select Products Company, or approved equal, are acceptable materials.

3.3.4 Bearing and filler pads shall be installed as shown on the Drawings. They shall be glued to the concrete with an approved rubber cement material to prevent uplift of the pads during concrete placement. In addition, all pads shall be held down with approved plastic shim plates placed under the reinforcing steel. Nailing pads in place will not be permitted.

3.4 SURFACE FINISHING

3.5.1 The exterior surface shall receive a smooth finish in accordance with Section 03100.3.5.1 of the Standard Specifications, unless a color is to be applied to the tank. If a color is to be applied, the surface shall receive a grout cleaned, cork floated or other suitable rubbed finish with the color applied with the rubbing mixture as required.

3.4.2 The interior tank floor and walls shall be smooth finished in the same manner as described above for the exterior surfaces and then cleaned and waterproofed.

3.5 CLEANING AND WATERPROOFING

3.6.1 After construction is completed, the interior of the tank shall be completely hosed out and cleaned of all dirt and loose material.

3.5.2 If shrinkage cracking is observed on the floor surface, the floor shall be covered with a minimum of two inches of water and pure cement shall then be spread evenly over the entire floor area at the rate of one sack of cement to every 1,000 square feet of floor area. The floor shall not be allowed to dry after the application of cement.

Should repeated cement seeding fail to seal the floor cracks, each crack shall be pumped and sealed with a two-part water insensitive epoxy.

3.6 DISINFECTING AND FILLING

3.7.1 The water storage tank shall be disinfected in accordance with the requirements of AWWA Standard C652-02. Test documentation shall be maintained in accordance with the requirements of Section 02222.3.7.5 of the Standard Specifications.

3.7 WATERTIGHTNESS PREPARATION

3.8.1 After construction of the reservoir or tank has been completed, and before backfilling, the floor and inside of the walls shall be broom-cleaned. The floor shall be squeegeed of curing water and washed with clean water. After the sweeping and the removal of all debris, any cracks greater than 0.004 in. wide and joints shall be properly sealed in accordance with provisions of Section 03 30 11 SP, 3-7. Completely hose down the interior surfaces of the reservoir with water under pressure.

3.8 TESTING

3.9.1 The overflow funnel and standpipe shall be tested for leakage before the tank is filled with water for the first time. Testing shall be accomplished by filling the overflow standpipe to the top of the funnel and allowing it to stand for not less than 4 hours. The entire length of the standpipe from the top of the funnel to the floor of the tank shall be examined for leakage. Any leakage shall be permanently repaired and the standpipe shall be retested. Once the overflow standpipe and funnel system passes the leakage test, the tank can be filled for initial leakage testing.

3.8.2 Testing of the tank shall be accomplished after filling the tank. The water level shall be held at the overflow for a period of 24 hours. The tank shall then be examined for evidence of leaks. All leaks shall be repaired to the satisfaction of the Engineer. Once all repair work is completed, the tank shall again be disinfected.

3.8.3 Watertightness testing shall be performed. Two tests are required. The first test shall be made on the overall watertightness of the tank. The second test shall be made on the visible surfaces of the tank.

3.8.4 Overall Watertightness Testing

3.8.4.1 Fill to the overflow and allow tank or basin to stand full for at least 24 hours. During the first 24 hours, the surface of the water may drop, and shall be refilled to the overflow.

3.8.4.2 The water level elevation shall be determined by using a surveyor's level and level rod or other acceptable means. Measure the drop in water level over the next 5 days to determine the water volume loss for comparison with the acceptance criteria. Floating “evaporation and precipitation pans” shall be used to remove these effects from the test. The liquid loss for each period of 24 hours shall not exceed 0.0125 of the tank capacity (or height), which shall be translated to the nearest 1/16 in. in the 5-day period.

3.8.5 Visible Surface Testing

3.8.5.1 Wet spots on the exterior wall surface or flowing water on the wall base shall not be permitted. Wet spots are defined as spots where moisture can be picked up on a dry hand. Wet spots shall be repaired in accordance with Section 03 30 11 SP, Part 3-7.

3.8.6 If the watertightness testing fails to meet the above requirements, the Engineer may require the reservoir or tank to be drained, repaired and again tested for watertightness.

3.9 LEAK REPAIR, AND ACCEPTANCE

3.10.1 Several leak detection methods are available to the CONTRACTOR. Any of these procedures may be required by the Engineer when cement seeding has not stopped the

leaks. All chipped out concrete areas, resulting from leak repair, shall be properly dry-packed with a mix of 1 part cement to 2 parts coarse sand, after coating the existing bare concrete surface with an approved epoxy.

3.9.2 Leaks in the floor or floor to wall construction joints may be detected with the aid of a diver. Mud or cement deposits on the floor, when stirred up, would flow to the leak and may so indicate where the leaks are. Honeycomb and cracks around water stops may be detected through tapping with a hammer along the joint. Such leakage through joints, which may have resulted from bent over water stops or honeycomb under or around water stops, may require the removal of concrete around the water stops in suspected areas.

3.9.3 The acceptable drop in water level of covered water tanks shall not exceed 1/10 inch per 24 hours in the second week after the tank has been filled. There shall be no visible running leaks or water puddles. Small damp spots will be accepted during the first 6 months of operation, but if they have not healed by then, the Engineer may order the immediate repair of the tank. Any cracks, voids, honeycomb or cold joints showing or causing running leaks of water, shall be epoxy pumped by qualified operators until such cracks and voids have been completely sealed.

3.10 PIPING AND APPURTENANCES

3.11.1 The Contractor shall provide and install all piping, components, ladders, hatches, vents, and other appurtenances as required by these SPECIFICATIONS and as shown on the DRAWINGS and shall make all connections as required on the tank drawings and details to provide a fully functional tank system.

3.11 METHOD OF MEASUREMENT

3.12.1 Measurement of the Concrete Storage Tank shall be "lump sum" and shall include all clearing, grubbing, site work, excavation, earthwork, materials, subgrade and foundation preparation, compaction, grading and restoration of the entire tank site, grading, surfacing, structures, electrical and instrumentation, piping, (including the couplings for connection to the balance of project piping), furnishings, appurtenances, site fence, and all other necessary labor, materials, and components within 20 linear feet outside of the tank site property boundaries, along with the tank drain line to its end point, and the drain line rip rap pad, as required to provide a complete and operating tank system as shown on the DRAWINGS and required by the project SPECIFICATIONS. All work 20 feet (linear feet for piping except the drain line as described above) and greater outside of the site fence line shall be measured and paid under separate bid items on the bid schedule. The Contractor shall make its own computations for ordering concrete and other materials. No measurement will be made for concrete required to fill over excavation for footings, walls or slabs. No deduction will be required for concrete volume occupied by piping, reinforcing steel, anchors, hatches or man-ways.

3.13 BASIS OF PAYMENT

3.13.1 The basis of payment for this item will be broken out into smaller bid items as listed in the table below, and in other bid items specific to the tank and tank site, but regardless of the individual bid items in the table and other bid items, all work to provide a complete and operating tank, within the site boundary fence and the piping extending 20 linear feet outside of the tank site fence as described in the method of measurement above shall be completed.

3.13.2 The accepted quantities will be paid for at the contract unit prices for:

PAY ITEM	UNIT
Concrete Water Storage Tank Site Work, Excavation, Earthwork & Grading	Lump Sum
550,000 Gallon Concrete Water Storage Tank	Lump Sum

03200.1 DESCRIPTION

Includes steel bars, wire fabric and rod mats required for cast-in-place concrete, with the necessary support chairs, bolsters, bar support and spacers required for supporting the reinforcement.

03200.1.1 RELATED Work

Section 03050 - Portland Cement Concrete
Section 03300 - Concrete Structures and Slabwork
Section 04810 - Unit Masonry Assemblies

03200.1.2 SUBMITTALS

03200.1.2.1 MILL TEST CERTIFICATION - Manufacturer's mill test certificates of supplied concrete reinforcement, indicating physical and chemical analysis shall be submitted.

03200.1.2.2 WELDER CERTIFICATION - Each welder's certification data shall be submitted to and approved by the Engineer prior to performance of welding on the project.

03200.1.2.3 SHOP DRAWINGS - Shop Drawings shall be submitted and shall indicate the sizes, spacings, locations and quantities of reinforcing steel and wire fabric; bending and cutting schedules; any proposed splicing; and reinforcement support, spacing devices and stirrup spacing.

03200.1.2.4 BAR SUPPORT SAMPLES - The Contractor shall submit for the Engineer's approval, samples of all bar supports it proposes to use along with a written description of where each type of bar support would be used.

03200.1.3 DEFINITIONS

Not used.

03200.2 MATERIALS

03200.2.1 CONCRETE REINFORCEMENT MATERIALS

03200.2.1.1 STEEL REINFORCEMENT - Unless otherwise specified, reinforcing steel shall be grade 60 billet steel conforming with ASTM A-615, including supplementary requirements S1. All such reinforcing shall be deformed steel bars with deformations in accordance with ASTM A-615. Bars shall be either uncoated or coated as indicated. ASTM A-706 steel shall be used if welding is indicated or allowed. All reinforcement shall be supplied in the maximum lengths practical or as indicated, unless otherwise authorized by the Engineer.

03200.2.1.2 WIRE FABRIC - Welded steel wire fabric shall be in accordance with ASTM A-185 plain type. It shall be new stock and free of any rust when placed in the Work. Wire fabric may be supplied in flat sheets or coiled rolls, and may be either coated or uncoated as indicated.

03200.2.1.3 STIRRUPS - Stirrup steel shall be in accordance with ASTM A-82.

03200.2.1.4 SPIRAL REINFORCEMENT - Spiral reinforcement for columns or other components shall be cold drawn steel wire in accordance with ASTM A-82.

03200.2.1.5 DOWEL BARS - Plain dowel bars for expansion joints shall be in accordance with ASTM A-615, 60-ksi-yield grade steel. Dowel bars shall be epoxy coated in roadway pavements. Metal dowel cans shall be provided at one end of dowel to permit longitudinal movement of the dowel within the concrete section. The Contractor shall provide for movement equal to the joint width plus 0.5-

inch. Load transfer bars shall be painted with 1 coat of paint conforming to AASHTO M-254 and coated 1/2 with grease.

03200.2.2 ACCESSORY MATERIALS

03200.2.2.1 TIE WIRE - Tire wire shall be 16-gauge minimum cold drawn plain steel wire, and shall be in accordance with ASTM A-82.

03200.2.2.2 REINFORCEMENT SUPPORTS - Unless otherwise required in the Drawings or these Specifications, reinforcement supports bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place shall be wire type bar supports complying with CRSI recommendations. Wood, brick, and other unacceptable materials will not be allowed.

03200.2.2.3 SUPPORTS EXPOSED TO VIEW - Where support legs are in contact with forms on concrete surfaces exposed to view, supports shall be stainless steel or shall be provided with either hot-dip galvanized or plastic protected legs.

03200.2.3 FABRICATION

03200.2.3.1 STANDARDS - Steel reinforcement shall be cut, bent and fabricated in accordance with ACI 315 and with approved machine methods, in either the shop or the field.

03200.2.3.2 BENDING - Bars shall be accurately formed to the dimensions shown on the Drawings or applicable bending schedule. Bending or straightening in the shop or the field shall be accomplished so that the steel is not damaged. All bars shall be cold bent. Bends for hooks on bars shall be made around a pin having a diameter not less than 6 times the minimum thickness of the bar. Kinked bars shall not be used. Bars with bends not indicated on Drawings or final Shop Drawings shall not be placed in the Work. Reinforcement bars shall not be bent after they are embedded in concrete.

03200.2.3.3 SPLICES - Reinforcing splices not indicated on the Drawings shall be approved by the Engineer, and shall be located at points of minimum stress. The location of splices shall be indicated on Shop Drawings. Welding of reinforcing bars, when authorized by the Engineer, shall be performed in accordance with AWS D1.4. All rebar which is welded shall be grade 60 ASTM A706 material.

03200.3 CONSTRUCTION REQUIREMENTS

03200.3.1 DELIVERY AND STORAGE

03200.3.1.1 DELIVERY - Deliver reinforcement to the job site bundled, tagged and marked. Use metal tags indicating bar size, lengths and other information corresponding to markings shown on placement diagrams.

03200.3.1.2 STORAGE - Take all means necessary to protect reinforcement materials before, during and after installation and to protect the installed work of other trades. Store all reinforcement materials in a manner to prevent excessive rusting and fouling with grease, dirt and other bond breaking coatings. Take all necessary precautions to maintain identification after bundles are broken. In the event of damage or errors, immediately make all repairs or replacements necessary and at no additional cost to the Owner.

03200.3.2 REINFORCEMENT ERECTION

03200.3.2.1 CLEAN AND SOUND MATERIALS - At the time of placement in the Work, reinforcement shall be free of loose mill scale, loose or excessive rust, paint, oil or grease, or other coating which may destroy its bond with the concrete. Bars with reduced cross-section due to rusting or other cause, even if all rust has been removed, shall not be allowed in the Work.

03200.3.2.2 CLEARANCE - Maintain the distance from vertical forms and between layers of reinforcement by means of prefabricated chairs, ties, hangers or other approved devices in accordance with "reinforcement support" paragraphs below. Placement and fastening of reinforcement in each section of the Work must be approved before concrete is placed.

03200.3.2.3 CLEAR DISTANCE - The clear distance between parallel bars shall not be less than one and one-half times the diameter of the bars, and shall in no case be less than 1 inch nor less than the maximum size of the coarse aggregate specified.

03200.3.2.4 MINIMUM COVER - Unless otherwise shown on the Drawings or approved by the Engineer, for all formed surfaces, the minimum concrete cover over the steel reinforcement shall be 1 1/2 inches for bars number 5 and smaller and 2 inches for bars number 6 through 18. The largest specified cover shall be used when different sized bars are encountered in the same face. No "bury" or "carrier" bars will be allowed unless specifically approved by the Engineer.

03200.3.2.5 CUTOUTS AND OPENINGS - Where reinforcing steel has to be cut to permit passage of pipe or to create openings with no detail available on the Drawings for extra reinforcement in such areas, the area of steel removed by the creation of the opening must be replaced by placement of at least double the area of the steel removed equally around the openings created. The steel shall be placed such that it extends 5 feet beyond the opening on each side, to provide for sufficient bond.

03200.3.2.6 METAL MESH - Sheets of metal mesh shall be bent as shown or required on the Drawings to fit the work. It shall be rolled or otherwise straightened to make a perfectly flat sheet before placement in the Work. Supports for metal mesh shall meet requirements for reinforcing bar supports.

Sheets of metal mesh shall be spliced in accordance with ACI 318 and shall be overlapped no less than 12 inches or one square plus 6 inches, whichever is greater, to maintain a uniform strength. The mesh shall be securely fastened at the ends, edges and at all supports to maintain clearances and overlaps.

03200.3.2.7 NOTICE TO OTHER TRADES - The Contractor shall ensure that all other crafts, sub-contractors, engineering support groups, and etc., whose work is related to concrete placement, are provided with ample notice and opportunity to introduce and finish required embedded items before concrete placement. All sleeves, inserts, anchors and any other embedded items shall be located and set in place prior to concrete placement. All voids in embedded items shall be temporarily filled to prevent entry of concrete.

03200.3.3 SPLICING

03200.3.3.1 ENGINEER APPROVAL - Except as shown on the Drawings, reinforcing steel shall not be spliced at any location without specific written approval of the Engineer. Splices in adjacent bars shall be staggered as directed by the Engineer.

03200.3.3.2 LAP SPLICES - Unless shown otherwise on the Drawings, or approved by the Engineer, bars up to and including number 11 shall be lap spliced in accordance with ACI 318 and shall be fastened together with steel wire.

Unless shown otherwise on the Drawings, or approved by the Engineer, bars at a lap splice shall be in contact with each other, and in no case shall the lap be less than 40 diameters of the spliced bars.

Unless shown otherwise on the Drawings, or approved by the Engineer, where bars are to be lap spliced at joints in the concrete, all bars shall project from the concrete first placed for a minimum length equal to the lap splice length as indicated on the Drawings. All concrete or other deleterious coating shall be removed from dowels and other projecting bars by wire brushing or sand blasting before the bars are embedded in a subsequent concrete placement.

03200.3.3.3 WELDING - Reinforcing steel shall be welded only if shown on the Drawings, or approved in writing by the Engineer. All welding of reinforcing steel shall comply with AWS D1.4.

03200.3.3.4 EXPANSION JOINTS - Reinforcement, or other embedded metal items bonded to the concrete, shall not be permitted to extend continuously through any expansion joint, with the exception of dowels in floors bonded on only one side of joint.

03200.3.4 REINFORCMENT SUPPORT

03200.3.4.1 PLACEMENT - All reinforcement shall be supported and retained in place, true to indicated lines and grades, by the use of approved bar supports, sized to position the steel in the exact location required on the Drawings. Supports shall be spaced at intervals of not more than 5 feet on center in any direction, to prevent movement of the steel during concrete placement. Deck steel shall be tied down to beams or forms at regular intervals not exceeding 5 feet on center in any direction.

03200.3.4.2 CONCEALMENT - Supports shall be completely concealed in the concrete and shall not discolor or otherwise mar the surface of the concrete.

03200.3.4.3 SAND PLATES - Supports with sand plates or horizontal runners shall be used for slabs on grade where the base material will not support chair legs.

03200.3.5 QUALITY COMPLIANCE

Reinforcing materials found to be damaged or at variance with the requirements of the Drawings or these Specifications for size, quantity, strength, position, arrangement, or other attribute, shall result in rejection of the concrete Work if they are not brought into compliance.

03200.4 METHOD OF MEASUREMENT

03200.4.1 NO MEASUREMENT

Unless shown otherwise, concrete reinforcement shall be included with the concrete item within which it is installed and no separate measurement shall be made.

03200.4.2 SEPARATE MEASUREMENT

When shown as a separate item on the Bid Schedule, measurement of reinforcing steel will be, based on the theoretical or calculated number of pounds placed and accepted according to the requirements of the Drawings and these Specifications. Measurement shall exclude splice bars used to replace test samples. No deductions will be made for any bends except for hooks. The length of the bar to be added to out-to-out dimensions of hooked bars will be shown on the plans. The weight calculations shall be based upon the following table:

WEIGHT CALCULATIONS FOR REINFORCING STEEL

Size	Lbs. per Lineal Foot	Size	Lbs. Per Lineal Foot
1/3 inch	0.167	#8	2.670
#3	0.376	#9	3.400
#4	0.668	#10	4.303
#5	1.043	#11	5.313
#6	1.502	#14	7.650
#7	2.044	#18	13.600

03200.5 BASIS OF PAYMENT

The accepted quantities of reinforcing steel will be paid for at the contract unit price. No allowance will be made for clips, wires or other material used for fastening reinforcement in place.

Payment will be made under:

PAY ITEM	UNIT
Reinforcing Steel	Lb.

03300.1 DESCRIPTION

Covers concrete placement operations for cast-in-place structural building frames, slabs and other components.

03300.1.1 RELATED WORK

Section 03050 - Portland Cement Concrete
Section 03100 - Concrete Forming, Finishing and Curing
Section 03200 - Concrete Reinforcement
Section 03310 - Concrete Joints for Slabwork
Section 03600 - Grout and Mortar

03300.1.2 SUBMITTALS

03300.1.2.1 RECORD OF PLACED CONCRETE - Contractor's record of placed concrete, which indicate the date, time, temperature, location, quantity, names/types of any additives used, and type of curing materials or procedures used.

03300.1.2.2 DELIVERY TICKETS - Copies of delivery tickets which indicate the date and time of delivery; the producer and the truck number; the volume of delivery; and the amounts (weights) of cement, aggregates and any additives, including all water added at plant and in the field.

03300.1.3 DEFINITIONS

Not used.

03300.2 MATERIALS

03300.2.1 CONCRETE

Shall meet Class and material requirements of Section 03050.

03300.2.2 BONDING COMPOUND

Shall be polyvinyl acetate or acrylic base, non-rewettable type.

03300.2.3 VAPOR BARRIER

Shall be minimum 6 mil thick, polyethylene sheet, and the Contractor shall allow for 6 inch overlap at all edges, unless shown otherwise on Drawings. Vapor Barrier required for below grade application shall be free from pin holes, tears, scars and other defects.

03300.2.4 FORMS

Shall meet requirements of Section 03100.

03300.2.5 REINFORCEMENT

Shall meet requirements of Section 03200.

03300.2.6 COVERINGS AND CURING COMPOUND

Shall meet requirements of Section 03100.

03300.2.7 GROUT

Shall meet requirements of Section 03600.

03300.2.8 WATERSTOP

Water stop shall be of the materials described and placed in the joints where shown on the Drawings and called for in these specifications. Precautions to insure proper support and location for the water stop during concrete placement shall be taken.

03300.3 CONSTRUCTION REQUIREMENTS

03300.3.1 PREPARATION

03300.3.1.1 ENGINEER NOTIFICATION - The Engineer shall be given not less than 24 hours notice of a pour before it starts.

03300.3.1.2 REINFORCEMENT AND OTHER MATERIALS - All anchors, seats, plates, reinforcement and other items, to be embedded or cast into concrete, shall be accurately placed, held securely, and not impede concrete placement.

03300.3.1.3 CONSTRUCTION LOADS - The Contractor shall ensure that construction loads shall not exceed member capacity.

03300.3.1.4 PREVIOUSLY PLACED CONCRETE - The Contractor shall prepare previously placed concrete by bush hammering or cleaning with steel brush, as required by the Drawings or these Specifications, and by application of the required bonding compound in accordance with manufacturer's instructions.

03300.3.1.5 DOWELING TO EXISTING WORK - At locations where new work is to be doweled to existing work, the Contractor shall drill 1 inch minimum oversize holes 20 bar diameters deep into the existing concrete. Holes shall be thoroughly cleaned with oil free air filled with epoxy grout from the bottom out, then insert the dowel full depth.

03300.3.1.6 TEMPERATURES - Temperature at the time of placement shall meet requirements provided in Section 03050 and Subsection 03300.3.4.1 below.

03300.3.1.7 DELIVERY - The Contractor shall ensure that concrete delivery meets all requirements of Section 03050.

03300.3.2 CONCRETE PLACEMENT

Concrete shall be conveyed, deposited and consolidated by methods that preclude separation or loss of ingredients.

03300.3.2.1 CONVEYING OF CONCRETE – Conveying of concrete shall be carried out as follows:

- Chutes for conveying concrete shall be sloped to permit concrete of the required consistency to flow without segregation.
- Where necessary, chutes shall be supplied with baffle boards or a reversed section at the outlet.

- Concrete shall not be allowed to drop more than 6 vertical feet without the assistance of pipes or tremies.

03300.3.2.2 DEPOSITION OF CONCRETE – Deposition of concrete shall adhere to the following requirements:

- Concrete shall not be placed if the subgrade is muddy, soft, or frozen.
- Concrete shall be deposited as near to its final position as practical.
- Use of vibrators for shifting concrete is not permitted.
- Concrete shall be placed in horizontal layers insofar as practical with placement starting at the low point and proceeding upgrade.
- Concrete slabs or footings shall be placed on compacted soil surfaces and the subgrade shall have a dampened condition. To achieve the dampened condition, the subgrade may be sprinkled with water in advance of placing concrete.
- Concrete placement shall be continuous between construction joints and shall be terminated with square ends and level tops unless otherwise shown on the plans.
- Concrete shall not be placed in horizontal sections until the concrete in the adjoining vertical members has been consolidated and 2 hours has elapsed to allow for shrinkage.
- Where concrete is to be deposited against hardened concrete joints, placement shall not begin until a grout mixture has been coated on the joint. This grout mixture shall consist of mixture prescribed in Section 03600.

03300.3.2.3 CONSOLIDATION OF CONCRETE - Consolidation of concrete, except for slope paving and concrete placed underwater, shall be accomplished through the use of vibrators as follows:

- A sufficient number of spare vibrators shall be kept available to preclude interruption of concrete placement due to vibrator failure and to have the capacity to consolidate the concrete mass within 15 minutes after placement in the forms.
- The location, manner and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without separation of the mortar and coarse aggregate, and without causing water or cement paste to flow to the surface.
- Vibrators shall be operated so as not to contact the subgrade, reinforcing steel or form work, and shall not be used to move the mass of concrete horizontally.
- External vibration, except for vibrating screeds, shall not be used, unless approved by the Engineer prior to the start of concrete placement.

03300.3.3 WATERSTOPS

Waterstops in the walls shall be carried into the slabs below and shall join the waterstops in the slabs with factory-made fittings or welded joints. All joints in water-bearing structures shall have waterstops, whether indicated on the plans or not. For other location requirements for waterstops, see the general notes of the plans.

03300.3.4 TIME LIMITATIONS

Mixed concrete shall be rejected if it is not placed within 90 minutes after water is introduced into the mixture and air temperature is 80°F or less, or if it is not placed within 60 minutes after water is introduced into the mixture and air temperature is above 80°F; or if the initial set has developed.

03300.3.5 HOT OR COLD WEATHER PLACEMENT REQUIREMENTS

03300.3.5.1 TEMPERATURE LIMITATIONS - Concrete temperature shall be between 50°F and 90°F at the time of placement in the forms.

03300.3.5.2 HOT WEATHER CONDITIONS - Hot weather conditions shall be considered to exist when ambient temperatures exceed 90^0 F, or when the ambient temperature is below 90^0 F but the temperature to humidity relationships shown in the following table for conditions below 90^0 F exist.

TEMPERATURE/HUMIDITY RELATIONSHIP

Relative Humidity Less Than (Percent)	Air Temperature Greater Than (°F)	Maximum Concrete Temperature (°F)
80	90	90
70	90	90
60	90	90
50	90	85
40	90	80
30	80	75
20	75	70

During hot weather conditions, the Contractor shall take the following steps to protect the concrete:

- The concrete ingredients shall be cooled before mixing to maintain concrete temperature at time of placement below the maximum acceptable values listed in the table below.

  Mixing water may be chilled, or chopped ice may be used to control the concrete temperature, provided the water equivalent of the ice is calculated into the total amount of mixing water. Ice shall be completely melted and dispersed throughout the mix at the completion of the mixing time.

  All methods and equipment for cooling of water and aggregate shall be subject to approval of the Engineer, and shall conform to ACI 305.

- Reinforcing steel shall be covered with water-soaked burlap as required, to prevent the steel temperature from exceeding the ambient air temperature immediately before concrete placement.

- Forms shall be thoroughly wet, but free of standing water, before concrete placement. Concrete should be placed in shallower layers than under normal weather conditions if necessary to assure coverage of the previous layer while it will respond readily to vibration.

- Fog spray shall be used during finishing whenever necessary to avoid surface plastic-shrinkage cracking. Fog spray shall also be used after finishing, before the specified curing is commenced, to avoid surface plastic-shrinkage cracking.

- Forms shall be kept covered and continuously moist. Once forms are loosened and during form removal, concrete surfaces shall be protected from drying, and shall be kept continuously wet by fog spraying or other approved means.

Additional costs due to concrete placement in hot weather conditions shall be the responsibility of the Contractor.

03300.3.5.3 COLD WEATHER CONDITIONS - Cold weather limitations shall apply when air temperature falls below 40°F. Procedures for protecting concrete shall be in accordance with ACI Standard 306, "Recommended Practice for Cold Weather Concreting." If concrete placement is necessary during low temperature conditions, the Contractor shall take the following steps to protect the concrete:

- The Contractor shall heat all water and aggregates uniformly in accordance with Section 03050 before mixing, to obtain a concrete mixture temperature between 60°F and 90°F at the time of placement.

- The Contractor shall not use calcium chloride, salt or other material containing antifreeze agents or chemical accelerators unless approved otherwise in writing by the Engineer.

- If temperatures are expected to drop below 32°F the night before the concrete is placed, all reinforcement, the forms, and the ground shall be preheated at a minimum temperature of 50°F for a minimum of 12 hours prior to placement.

- The concrete shall be protected from freezing. The Contractor shall furnish all materials and equipment to insulate and to heat the work as necessary to maintain concrete temperatures above 50°F.

- Concrete temperature shall be maintained at not less than 50°F and not more than 70°F for the first 7 days after placement.

- Combustion type heaters, which produce carbon monoxide (CO), shall be adequately vented.

The Contractor shall assume all risk in connection with placing concrete in cold weather conditions. Permission given to place concrete in cold weather shall in no way relieve the Contractor of the responsibility for compliance with these Specifications. Any work not in compliance with these Specifications due to cold weather conditions shall be removed and replaced at the Contractor's expense.

03300.3.6 JOINTS

03300.3.6.1 COMPLIANCE - Construction joints shall be placed at the locations shown on the Drawings or as approved by the Engineer. Expansion and contraction joints and joint sealing shall be accomplished in accordance with Section 03310.

03300.3.6.2 CLEANING - Unless otherwise directed by the Engineer, all construction joints shall be cleaned prior to placement of concrete. All unsatisfactory concrete, latency material, stains, debris, and other foreign materials shall be removed. After cleaning, the surface shall be washed thoroughly to

remove all loose material. Excess water shall be disposed of in such manner that it will not stain, discolor, or otherwise affect adjacent surfaces of the structures.

03300.3.7 FINISHING

Finishing shall be accomplished as indicated on the Drawings and in accordance with the requirements of Section 03100. Water shall not be sprinkled on concrete surfaces during finishing.

03300.3.8 CURING

Curing shall meet the requirements of Section 03100.

03300.3.9 PROTECTION

The Contractor shall provide necessary barriers, walkways, etc. to protect freshly placed concrete from physical damage. Any damage sustained as a result of failure to provide such protection shall be corrected at the Contractor's expense.

03300.3.10 REPAIR OF DEFECTIVE CONCRETE

03300.3.10.1 REPAIR FOR NON-COMPLIANCE - All concrete that fails to conform to required material characteristics, dimensions, lines, finishes and elevations shown on the Drawings, or in accordance with these Specifications shall be replaced or corrected in accordance with these Specifications and as approved by the Engineer.

03300.3.10.2 ADDITIONAL TESTING - Any engineering analysis and additional testing required to determine the extent of repair will be provided by the Contractor at no additional cost to the Owner.

03300.3.10.3 REMOVAL OF SLABS WITH CRACKS - Removal of concrete sections with cracks in slabs which occur within 2 feet of expansion or construction joints may be deemed necessary by the Engineer.

03300.3.11 QUALITY COMPLIANCE

Concrete work may be rejected for failure to comply with the following requirements:

03300.3.11.1 SPECIFICATION NON-COMPLIANCE - Concrete work shall be rejected if the materials used in the work fail to comply with the requirements of Section 03050 and 03200.

03300.3.11.2 STRENGTH TEST FAILURE - Concrete work, for which the average of three 28-day compressive or flexural strength samples made from the same batch falls below the acceptance level, shall be rejected, unless otherwise directed by the Engineer.

03300.3.11.3 IMPROPER CURING - Concrete work for which the method of curing is not as specified, or that has been inadequately protected from extremes of temperature during the early stages of hardening and strength development, shall be rejected, unless otherwise directed by the Engineer.

03300.3.11.4 ACCIDENT AND INJURY - Concrete work that has been subjected to construction fires, accidents, mechanical injury or premature removal of formwork likely to result in deficient strength development, shall be rejected, unless otherwise directed by the Engineer.

03300.3.11.5 POOR WORKMANSHIP - Concrete work, subjected to poor workmanship that may result in deficient strength or load carrying capacity, including but not limited to honey combing, cold

joints, introduction of contaminants or embedded debris, improper placement location or dimensions, and etc., shall be rejected, unless otherwise directed by the Engineer.

03300.3.11.6 POOR FINISH - Concrete work that fails to meet the required finish in accordance with the requirements of Section 03100, or exposed concrete with defects adversely affecting the appearance of the specified finish shall be rejected, unless otherwise directed by the Engineer.

03300.4 METHOD OF MEASUREMENT

03300.4.1 NO MEASUREMENT

When concrete is not indicated as a separate item in the Bid Schedule, no measurement will be made and the concrete required for a structure shall be considered a component of another item or items shown in the Bid Schedule.

03300.4.2 SEPARATE MEASUREMENT

03300.4.2.1 CUBIC YARD - When concrete is indicated as a separate item on the Bid Schedule, measurement shall be made by counting the number of cubic yards placed and accepted as determined by calculating volumes using the dimensions shown on the Drawings. This measurement shall NOT include:

- Any allowance for reinforcing steel in concrete.
- Any allowance for concrete required for filling over-excavation for footings, walls or slabs.
- Any allowance for volume occupied by pipes (except culverts), reinforcing steel, anchors, conduits, or weep holes.

03300.4.2.2 SQUARE UNIT – Measurement for square feet or yards of concrete shall be made using an accurate measuring device to determine the length and breadth of concrete placed and accepted and then multiplying those values to find the amount of area covered.

03300.5 BASIS OF PAYMENT

The accepted quantities shall be paid for at the contract unit price:

PAY ITEM	UNIT
Concrete (*Class* _____)	Cubic Yard
Concrete (*Class* _____)	Square Yard
Concrete (*Class* _____)	Square Foot
Concrete Structure (*Name*)	Lump Sum

SPECIAL PROVISION

CONCRETE PLACEMENT (COLD WEATHER PROCEDURES)	**SECTION 03301SP**

Definition of Cold Weather: Cold weather is defined as a period when for more than three (3) successive days the mean daily temperature falls below 40º F or any day when the temperature is expected to fall or falls below freezing.

PART 1 GENERAL

1.2 REFRENCES

A. APWA:
   1. Section 03 30 04: Cast-In-Place Concrete
   2. Section 03 39 00: Concrete Curing
   3. Section 03 30 10: Concrete Placement

1.3 SUBMITTALS

A. Not less than 30 days prior to expected placement of concrete under cold weather conditions, a complete procedure shall be submitted for review covering all aspects of protection of concrete and its ingredients from the detrimental effects of cold weather. Concrete placement during cold weather shall not commence prior to return of the procedure marked "Reviewed".

1.4 QUALITY ASSURANCE

A. The concrete temperature, during placement in cold weather, shall not be less than 50º F. Temperature measurements of the concrete as delivered to the job site shall confirm this requirement.

PART 2 PRODUCTS

2.1 MATERIALS

A. Water and aggregates may be preheated for cold weather placement; however, their temperature shall not exceed 150º F. All methods and equipment for heating of water and aggregate shall be subject to the approval of the Engineer and shall conform to ACI 306.

PART 3 EXECUTION

3.2 PREPARATION

A. No concrete shall be placed on frozen ground.

B. The ground, against which concrete is to be poured, must be protected against freezing after its preparation, or the concrete placement shall be delayed until the ground has fully thawed out.

C. When temperatures are expected to be below 32º F. the night before the concrete is placed, then all reinforcing steel, forms and the ground shall be preheated, for a minimum of 12 hours, under a minimum temperature of 50º F.

D. When temperatures are expected to be below 32º F any time before the concrete has reached a strength of 1000 psi, the concrete must be adequately protected against frost damage by heating blankets, straw or insulation materials for a minimum of 7 days or until at least 1000 psi concrete strength has been reached. The concrete temperature shall at no time fall below 40º F based on recording temperature monitors placed at a maximum of 50 feet on centers, each way, and around the circumference of the floor slab, and retaining wall. Contractor shall provide heat as required to keep the concrete temperature as specified throughout the entire curing period of 7 days.

E. Weather prediction made by the nearest NOAA station, and corrected for the local elevation and environmental conditions, may be used to determine whether cold weather

protection shall be required. Thermometers will be used by the Engineer and these readings shall determine whether cold weather protection shall be required and whether cold weather protection is adequate.

F. When combustion type heaters are used to maintain concrete temperatures within an enclosure, the exhaust gases shall be vented from the heater to the outside atmosphere so that the concrete is not exposed to the products of combustion.

G.

03310.1 DESCRIPTION

Furnish materials and install appropriate longitudinal and transverse expansion joints, construction joints and crack control joints in slabs and pavement.

03310.1.1 RELATED WORK

Section 03050 - Portland Cement Concrete
Section 03100 - Concrete Forming, Finishing, and Curing
Section 03300 - Concrete Structures and Slabwork

03310.1.2 SUBMITTALS

The Contractor shall submit the following to the Engineer for review and approval:

03310.1.2.1 PRODUCT CERTIFICATION – The manufacturer's certification that product was manufactured, tested and supplied in accordance with source control requirements specified herein, together with a report of the test results and the date each test was completed.

03310.1.2.2 INSTRUCTIONS – The manufacturer's instructions for joint preparation, type of cleaning and installation.

03310.1.2.3 DATA SHEETS – The manufacturer's product and safety data for each joint sealant product required.

03310.1.2.4 SAMPLES – A manufacturer’s sample of each joint sealant product required.

03310.1.3 DEFINITIONS

Not used.

03310.2 MATERIALS

03310.2.1 GENERAL

03310.2.1.1 COMPATIBILITY OF MATERIALS - Provide joint filler, sealant backings, sealants and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

03310.2.1.2 DELIVERY OF MATERIALS - Deliver materials to site in original unopened containers or bundles with labels identifying manufacturer, product name and designation, color, expiration period for use, pot life, cure time and mixing instructions for multi-component materials.

03310.2.1.3 STORAGE AND HANDLING OF MATERIALS - Store and handle materials in compliance with manufacturer's recommendations to prevent deterioration; or damage due to moisture, high or low temperatures, contaminants or other causes.

03310.2.2 PRODUCTS

03310.2.2.1 JOINT VOID FORMER - Shall be of plastic with a waterstop and shall extend 1/3 of the depth of the concrete structural section.

03310.2.2.2 JOINT FILLER - J4 joint filler shall be the required standard and shall be used unless another filler from the list below is specified. Fillers shall be non-extruding, resilient, and meet the requirements of ASTM D-545:

- F1 Joint Filler – 13mm thick filler for expansion joints; bituminous (asphalt or tar) mastic in accordance with ASTM D-994; formed and encased between 3 layers of bituminous saturated felt or 2 layers of glass fiber felt.

- F2 Joint Filler - Cane or other cellulosic fiber in accordance with ASTM D-1751, saturated with asphalt.

- F3 Joint Filler - Granulated cork in accordance with ASTM D-1751; in an asphalt binder; encased between 2 layers of asphalt saturated felt or 2 layers of glass fiber felt.

- F4 Joint Filler - Sponge rubber fully compressible in accordance with ASTM C-1752, with resiliency recovery rate of 90 percent minimum.

- F5 Joint Filler - Cork in accordance with ASTM C-1752; impregnated and bound with asphalt; compressible with resiliency recovery rate of 90 percent if not compressed more than 50 percent of original thickness.

- F6 Joint Filler - Plastic foam (for cold-applied sealants only) pre-formed, compressible, resilient, non-waxing, non-extruding strips of flexible, non-gassing plastic foam; non-absorbent to water and gas; 20 lb/ft^3 density maximum; and of size and shape to control sealant depth and performance.

- Synthetic Sponge Rubber Filler - Synthetic sponge rubber filler shall be an expanded closed cell sponge rubber, manufactured from a synthetic polymer neoprene base. The material shall be No. 750.3 Ropax Rod Stock as manufactured by the Presstite Division of Interchemical Corporation; Bondtex as manufactured by Rubatex Corporation; or approved equal. The size of the material shall be 25 percent greater in diameter than the nominal joint width. The manufacturer's instructions for surface preparation and application shall be used as a guide for installation, except that the material shall not be installed by stretching beyond its normal length.

03310.2.2.3 SEALANT - Hot applied joint sealant shall be one of the following:

- HAS1 Sealant - Resilient and adhesive compound type in accordance with ASTM D-3405, for Portland cement concrete or asphalt concrete pavements.

- HAS2 Sealant - Thermoplastic type in accordance with ASTM D-3581, jet fuel resistant without rubber, unless indicated otherwise.

- HAS3 Sealant - Elastomeric type in accordance with ASTM D-1190.

- HAS4 Sealant - Elastomeric type in accordance with ASTM D-3406, one component, for Portland cement concrete pavements.

- HAS5 Sealant - Elastomeric type in accordance with ASTM D-3569, one component, jet-fuel resistant, for Portland cement concrete pavements.

Cold applied joint sealant shall be one of the following:

- CAS1 Sealant - Elastomeric type in accordance with ASTM C-920; chemically curing, for vehicular or pedestrian use and types of construction other than highway and airfield pavements and bridges and joint substrates indicated; Type S or M; Grade P or NS; Class 25; Use T, NT, M and O with the following characteristics:

⇒ Self leveling
⇒ 40 ± 5 ASTM D-2240 Shore A Hardness
⇒ 4 days minimum final cure
⇒ 10 to +150^0 F service range

- CAS2 Sealant - Mastic type in accordance with ASTM D-1850, single or multiple companion, for joints having a minimum width of 1/2 inch.

- CAS3 Sealant - Coal tar modified urethane type in accordance with FS SS-S-200; one part, jet fuel resistant; Type H.

- CAS4 Sealant – Elastomeric, pre-formed polychloroprene type with lubricant adhesive and indicated movement ratio which meets one of the following:

  ⇒ For concrete pavement seal; ASTM D-2628
  ⇒ For concrete bridge seal; ASTM D-3542

Synthetic rubber sealant shall be as follows:

- The sealant shall be a 3-part polyurethane compound.

- Sealant shall be designed to cure at room temperature to a firm, highly resilient rubber.

- Sealant shall have the following properties determined at conditions of 75° F and 50 percent relative humidity:

  ⇒ Base - polyurethane rubber
  ⇒ Solids - not less than 97 percent
  ⇒ Application time - not less than 3 hours
  ⇒ Cure time - not more than 5 days
  ⇒ Ultimate hardness - 35 ± 5 (Shore A Durometer)
  ⇒ Tensile strength (ASTM D412) - 300 pounds per square inch minimum
  ⇒ Ultimate elongation - not less than 300 percent
  ⇒ Color - gray to match concrete unless otherwise indicated

- All packages shall be code dated. No material shall be more than 6 months old when used. Material shall have been kept at temperatures lower than 80° F at all times.

03310.2.2.4 BACKER ROD – Backer rod shall be neoprene, butyl, EPDM, or silicone tubing complying with ASTM D-1056, water and gasoline non-absorbent, capable of remaining resilient at temperatures down to -26°F. Provide product with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

03310.2.2.5 BOND BREAKER TAPE – Bond breaker tape shall be self-adhesive polyethylene or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to joint filler materials or joint surfaces at back or bottom of joint.

03310.2.2.6 WATERSTOPS - Waterstop shall be rubber waterstop or PVC waterstop as designated on the Plans or in the Special Provisions and shall meet the requirements described herein.

- Waterstops shall be as manufactured by Burke Concrete Accessories Inc., Kirkhill Rubber Company, Williams Products Inc., Greenstreak, or approved equal:

- Waterstop shall be of the width and cross-section configuration shown on the Drawings or required in the Special Provisions.

- At expansion joints, only hollow centerbulb type waterstop shall be used.

Rubber waterstop shall meet the following requirements and conditions:

- Waterstop shall be manufactured to ensure an integral cross section which will be dense, homogeneous, and free from porosity and other imperfections.

- Minor surface defects, such as surface peel, covering less than 1 square inch and surface cavities or bumps less than ¼" in longest lateral dimension and less than 1/16" deep, will be acceptable.

- The rubber waterstop shall meet the following Specifications:

  ⇒ Hardness-Shore A Durometer – 60 to 70, ASTM D 2240
  ⇒ Elongation - not less than 450%
  ⇒ Tensile Strength - not less than 3,000 psi
  ⇒ Tensile Strength after aging 48 hours in oxygen at 70°C and 300 psi - not less than 80% of original
  ⇒ 300% Modulus - not less than 900 psi
  ⇒ Water absorption after 2 days at 158°F – not more than 5%
  ⇒ Compression set after 22 hours at 158°F - not more than 30%
  ⇒ Specific Gravity - 1.17 ± .03

Polyvinylchloride (PVC) waterstop shall be as manufactured by Greenstreak, or approved equal, and shall meet the following requirements and standards:

Property	ASTM Test	Nominal Value
⇒ Water absorption	D 570	0.15
⇒ Tear resistance	D 624	350/lb.in.
⇒ Ultimate elongation	D 638	390%
⇒ Tensile strength	D 638	2250 psi min.
⇒ Low temperature brittleness	D 746	$+35^0$F/$+37^0$C (passed at)
⇒ Stiffness in flexure	D 747	1190 psi
⇒ Specific gravity	D 792	1.37
⇒ Ozone resistance	D 1149	No failure
⇒ Volatile loss	D 1203	0.30%
⇒ Hardness (Shore A15)	D 2240	76+/3
⇒ Accelerated Extraction		
Tensile strength		2130 psi
Elongation		370%

PVC waterstop shall be heat weldable, have great inherent elasticity, be impervious to many waterborne chemicals, be suitable for above or below grade installation, not produce electrolytic reactions, and not discolor concrete or mortar.

See Subsection 03310.3.4 for waterstop installation specifications.

03310.3 CONSTRUCTION REQUIREMENTS

03310.3.1 WEATHER CONDITIONS

Do not proceed with installation of joint sealant under unfavorable weather conditions. Install elastomeric sealant only when temperature is stable within the temperature range recommended by manufacturer for installation.

03310.3.2 PREPARATION

03310.3.2.1 JOINT CLEANING - Clean, prepare and size joints in accordance with manufacturer's instructions. Remove any loose materials and other foreign matter. Do not proceed with installation of joint sealant until contaminants capable of interfering with sealant adhesive properties are removed from joint substrates. Remove any moisture on the substrate.

Remove protective coating and any oil from metals with solvent recommended by the sealant manufacturer.

03310.3.2.2 JOINT DIMENSIONS - Examine joint dimensions and size materials to achieve required width to depth ratio. Adjust joint depths to allow sealant to perform properly.

03310.3.2.3 MATERIAL COMPATIBILITY - Verify that joint shaping materials and release tapes are compatible with sealant.

03310.3.3 CONSTRUCTION

03310.3.3.1 FEATURES AND PURPOSES OF JOINT CONSTRUCTION - Construct all joints as follows:

- At right angles to top surface of placement.
- Straight unless indicated otherwise.
- Before uncontrolled shrinkage cracking takes place.
- To prevent concrete edge slump.

03310.3.3.2 BOND BREAKER TAPE - Install where needed or required by manufacturer's recommendations to ensure that elastomeric sealant will perform properly.

03310.3.3.3 EXPANSION JOINTS - Expansion joints shall be constructed as follows:

- They shall be placed in locations as shown on the Drawings or as approved by the Engineer.
- Joints in exterior concrete slab work shall be placed where shown on Drawings or as recommended by Portland Cement Association's "Design and Control of Concrete Mixture Manual".
- Pre-molded filler strips shall extend full depth in slab.
- Unless otherwise noted on the Drawings or directed by the Engineer, isolation joints shall be used in all areas where slabs abut vertical surfaces. Joint material shall be placed as called for and in good alignment.
- In no case shall the reinforcing or other fixed metal items embedded in or bonded to concrete be made to run continuously through an expansion joint.
- Concrete edges at joints shall be neatly finished with an edging tool providing a slightly rounded edge on each side of the joint filler material.

03310.3.3.4 CONSTRUCTION JOINTS - Other references to construction joints are located in Subsection 03300.3.6.

03310.3.3.5 CONTROL JOINTS – Control joints shall be constructed as follows:

- Tooled Joints. Tooled joints shall be formed by scoring the slab full depth with a steel trowel along a straight edge in locations as shown on the Drawings or, if not shown, not to exceed 625 square feet in area. The joint shall be finished using a joint tool guided by a straight edge leaving a slightly rounded edge on each side of the joint.

- Sawn Joints. Sawn joints shall be sawn into interior concrete floors as indicated on the Drawings and at Contractor's option in place of pre-formed metal keys. Joints shall be sawn with a power saw designed to saw depth and width as shown on Drawings. Hand held saws will not be accepted. Saw cutting shall occur within 12 hours after placement of concrete. The line of the saw shall be straight, true to line and square. Pourable joint sealant shall be poured into all sawn joints. Installation shall be in strict accordance with manufacturer's specifications which shall include preparation, priming, etc.

03310.3.3.6 JOINT SEALING - Installation of joint sealant shall adhere to the following procedures:

- Manufacturer's Instructions. Application shall be in strict accordance with the manufacturer's published instructions.

- Surface Preparation. All surfaces to which synthetic rubber sealant must bond shall be dry and free of dust, dirt, and other foreign residue and shall be primed with the manufacturer's recommended primer for the particular surface. Remove all oil, grease, wax, form release agents, curing compounds, bitumen, old caulking, and other latent material by sand blast or water blast, as recommended by the sealant manufacturer. Maximum angle for sand blasting is 25 degrees $\pm$ 5. Clean and dry with air blast. Do not contaminate air blast with oils or lubricants. Remove frost and moisture in concrete joint substrates before commencing sealing.

- Installation. If necessary, joints shall be saw cut, to provide the required sealant thickness and depth. Application shall be by means of a pneumatic caulking tool or other approved method. Ensure that sealant is installed in uniform, continuous ribbons without gaps or air pockets, with complete bonding of joint surfaces on opposite sides. Except as otherwise indicated, fill sealant rabbet flush with surface. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove so that joint will not trap moisture and dirt.

  Install sealant to depths indicated or, if not indicated, as recommended by sealant manufacturer, but within the following general limitations measured at center (thin) section of bead:

  $\Rightarrow$ For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75 percent of joint width, but neither more than 5/8 inch deep nor less than 3/8 inch deep.

  $\Rightarrow$ For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2 inch deep nor less than 1/3 inch deep.

  $\Rightarrow$ For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75 percent to 125 percent of joint width.

- Overflow and Spillage. Do not allow poured sealant compound to overflow or spill onto adjoining surfaces or to migrate into voids of adjoining surfaces. Clean adjoining surfaces to eliminate evidence of spillage.

- Overheating. Do not overheat hot applied sealants.

- Exposed Edges. Unless indicated otherwise, recess exposed edges of gasket and exposed joint filler slightly behind adjoining surface so compressed units will not protrude from joints.

03310.3.3.7 CURING AND PROTECTION – The Contractor shall follow the steps listed below regarding curing and protection of sealant:

- Cure sealant and caulking compounds in accordance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

- Follow procedures required for cure and protection of joint sealants during construction period so they will be without deterioration or damage (other than normal wear and weathering) at time of Substantial Completion.

- Protect joint sealant during and after curing period from contact with contaminating substances, or from damage resulting from deterioration through the time of Substantial Completion.

- If damage or deterioration occurs, immediately cut out and remove damaged or deteriorated joint sealant and reseal joint with new materials. Repaired area shall be indistinguishable from un-repaired area.

03310.3.3.8 CLEANUP - Clean off all excess sealant or sealant smears adjacent to joints as the work progresses. Use methods and cleaning materials approved by manufacturers of joint sealant and of the products in which joints occur.

03310.3.4 WATERSTOPS

03310.3.4.1 INSTALLATION - Waterstops shall be installed in concrete joints where and as indicated on the Plans. Waterstops shall be set accurately to the position and line indicated on the Plans. Where required at expansion joints, the hollow, centerbulb type waterstop shall be installed centered on the joint.

03310.3.4.2 CONTINUITY - All waterstops shall be continuous. Waterstops in walls shall be carried into lower slabs and shall join the waterstops in the slabs with appropriate types of fittings. Waterstops shall be terminated 3 inches from the top of finished surfaces of walls and edges of slabs unless otherwise specified or indicated on the Plans

03310.3.4.3 FASTENING IN PLACE - Edges shall be held and securely fixed in position at intervals of not more than 24 inches to prevent movement during the placing of the concrete. Wires placed near the outer bulb and/or special clips may be used for this purpose, at the Contractor’s option. No nails shall be driven through a waterstop in the vicinity of any construction joint.

03310.3.4.4 JOINTS – Waterstop joints shall meet the following requirements

- All waterstop joints shall be watertight.

- All joints shall be made by the use of factory-made fittings and unions, some of which will be special.

- Fittings and unions shall be cemented in place using clamps over the entire area of splice until the cement is bonded permanently.

- Welding of the waterstop without the use of factory-made unions and fittings will not be permitted.

- Split type waterstop may be used, at the option of the Contractor, provided that all junctions between standard solid type waterstop and split type waterstop shall be made with solidly welded and cemented unions between the two waterstops. This union may be split and re-cemented in accordance with the manufacturer's recommended method.

- Cement shall be as recommended by the manufacturer of the waterstop, and field cementing or solvent welding shall be in accordance with the manufacturer's directions.

03310.4 METHOD OF MEASUREMENT

Unless otherwise indicated in these Specifications, no separate measurement will be made for the materials and work covered by this section.

03310.5 BASIS OF PAYMENT

Unless otherwise noted in these Specifications, no separate payment will be made for items under this section. Compensation shall be included in the prices paid for the various contract items and no separate compensation will be allowed.

03500.1 DESCRIPTION

This is a generic specification covering furnishing and installing of pre-cast concrete units, complete with required accessories as shown on the Drawings and called out in these Specifications.

03500.1.1 RELATED WORK

Section 01300 - Submittals
Section 02224 – Sewer Pipe and Manholes
Section 03050 - Portland Cement Concrete

03500.1.2 SUBMITTALS

03500.1.2.1 SHOP DRAWINGS - Submit shop drawings showing unit design, signed and sealed by a Professional Engineer, in accordance with Section 01300. The Contractor shall not proceed with fabrication until shop drawings have been approved.

03500.1.2.2 UNIT DESIGN – Unit design shall incorporate the following:

- Pre-cast units shall be designed in accordance with ACI 318 and PCA design handbooks under the direction of a Professional Engineer experienced in the design of such units.
- Indicate unit locations, unit identification marks, fabrication details, reinforcement, connection details, pertinent dimensions, and erection support points.
- Units shall be designed to support the required shipping and handling loads, and the live, dead and construction loads.
- Component connections shall be designed to provide adjustment to accommodate misalignment of structure during installation.
- The Engineer may approve design deviations provided that equivalent units serving the same basic function and intent are furnished at no additional cost to the Owner. Such deviations shall only be approved upon written request and when accompanied with complete design calculations and drawings.

03500.1.3 DEFINITIONS

Not used.

03500.2 MATERIALS

03500.2.1 ACCESSORIES

Connecting and supporting devices shall be carbon steel in accordance with ASTM A 36. Bolts, nuts and washers shall be carbon steel or stainless steel as required on the Drawings. Grade 60 reinforcement shall be provided for all units.

03500.2.2 IDENTIFICATION MARKS

Unit identification marks shall appear on all manufactured units.

03500.2.3 FINISHES

Shall be in accordance with one of the following paragraphs. If no finish is prescribed on the Drawings, the Standard Finish will be provided.

03500.2.3.1 STANDARD FINISH - Produced in plastic or metal lined forms which impart a smooth finish. Small surface holes, normal form joint marks, minor chips and spalls may be approved. Major or unsightly imperfections, honeycomb or structural defects are not acceptable.

03500.2.3.2 COMMERCIAL FINISH - Produced in plastic or metal lined forms which impart a smooth finish. Remove fins and large projections and fill holes over 1/2 inch with sand-cement paste. Faces shall be true and well defined. Exposed ragged edges shall be corrected by rubbing or grinding.

03500.2.3.3 ARCHITECTURAL GRADE FINISH - Produced in plastic or metal lined forms which impart a smooth finish. Fill holes over 1/4 inch in diameter with sand-cement paste. Grind smooth form offsets or fins over 1/8 inch. Coat with neat cement paste using a float and after paste has dried, rub with burlap to remove loose particles.

03500.2.3.4 SPECIAL FINISHES - Finishes produced by sandblasting, acid washing, or form liners shall be specifically defined on the Drawings or in these Specifications and samples showing texture and color will be required for approval.

03500.2.3.5 PAINTABLE FINISHES - Where unit surfaces will be painted, only form release agents compatible with paints shall be used during fabrication.

03500.3 CONSTRUCTION REQUIREMENTS

03500.3.1 FABRICATION

Fabrication of pre-cast units shall proceed as follows:

03500.3.1.1 RECORDS - Maintain plant records and quality control program during production of structural pre-cast concrete. Make records available to Engineer.

03500.3.1.2 MOLDS - Use molds which are rigid and constructed of material that will result in uniform finished products.

03500.3.1.3 PLACEMENT AND VIBRATION - Place and vibrate concrete to ensure: proper consolidation, elimination of cold joints, and minimize entrapped air marks on finished surfaces.

03500.3.1.4 REINFORCEMENT AND FITTINGS - Provide required connecting devices, plates, angles, and connectors to steel framing members, bolts and accessories. Ensure reinforcing steel, anchors, inserts, plates, angles and other cast-in items are sufficiently embedded, anchored and properly located.

03500.3.1.5 LIFTING DEVICES - Embedded lifting or handling devices shall be capable of supporting units in positions anticipated during manufacture, storage, transportation and erection.

03500.3.1.6 FINISHED SURFACE - Ensure finished surfaces of pre-cast structural units are uniform.

03500.3.1.7 CURING - Cure units under identical conditions to develop specified concrete quality and minimize appearance of blemishes such as non-uniformity, staining or surface cracking.

03500.3.2 DELIVERY, STORAGE AND HANDLING

03500.3.2.1 DELIVERY - Unless otherwise approved in writing, do not deliver units to job site until required for installation.

03500.3.2.2 EDGE PROTECTION - Provide edges of units with adequate protection to prevent staining, chipping or spalling of concrete.

03500.3.2.3 HANDLING - Handle pre-cast units in positions consistent with their shape and design. Lift and support only from support points indicated on Shop Drawings.

03500.3.2.4 BLOCKING AND BRACING - Block and laterally brace units while in storage. Provide lateral bracing that is sufficient to prevent bowing and warping. Bracing shall be clean, non-staining and of a type that will not inhibit uniform curing of exposed surfaces.

03500.3.3 INSTALLATION

Do not install pre-cast units until concrete has attained its design compression strength. Install members plumb, level and in alignment. Clean weld marks or other marks, debris or dirt from exposed surfaces of units.

03500.3.4 REPAIR

Repair of damaged units may be acceptable if structural integrity or appearance is not impaired.

03500.4 METHOD OF MEASUREMENT

03500.4.1 NO MEASUREMENT

Separate measurement for pre-cast concrete units will not be made when the unit is a component of a building, assembly or enclosure for which identification is made in the Bid Schedule.

03500.4.2 SEPARATE MEASUREMENT

When pre-cast concrete units appear as a separate item on the Bid Schedule, they will be measured either by counting the number of units installed and accepted or by using a measuring tape or other accurate measuring device to determine the total number of lineal feet of units installed and accepted.

03500.5 BASIS OF PAYMENT

Separate payment for pre-cast concrete units will not be made when they are a component of building, assembly or enclosure identified in the Bid Schedule.

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
Pre-Cast Concrete (*Describe*)	Each
Pre-Cast Concrete (*Describe*)	Lineal Foot

03600.1 DESCRIPTION

This section covers furnishing materials and placing Portland cement grout, epoxy grout, and mortar for finishing concrete surfaces, leveling beds for structural steel plates, sealing joints between piping and structures, and sealing joints between construction components.

03600.1.1 RELATED WORK

Section 03100 - Concrete Forming Finishing, and Curing
Section 03300 - Concrete Structures and Slabwork
Section 04100 - Brick Masonry
Section 04810 – Unit Masonry Assemblies

03600.1.2 SUBMITTALS

Provide description of mix components, which indicates proportions to be used, environmental conditions expected and ad mixture limitations. Indicate type, grade and class of materials which suit the requirements in accordance with Section 01300. Manufacturer's data shall be provided to the Engineer for all materials.

03600.1.3 DEFINITIONS

Not used

03600.2 MATERIALS

03600.2.1 PORTLAND CEMENT

Shall meet ASTM C-150, natural color, Type II (normal) or Type IIA (air entraining).

03600.2.2 HYDRATED LIME

Shall meet ASTM C-207, Type S.

03600.2.3 WATER

Shall be potable, or water which meets the requirements of AASHTO T-26.

03600.2.4 GROUT AGGREGATE

Shall be fine aggregate (generally masonry type sand), which meets the requirements of Section 03050 with a maximum particle size specified therein or on the DRAWINGS.

03600.2.5 PORTLAND CEMENT GROUT

Shall be one part Portland Cement to one part grout aggregate proportioned by volume. Mix for 5 minutes with sufficient water to achieve the consistency of thick cream. Minimum Compressive Strength - ASTM C-109, 2800 psi in 28 days.

03600.2.6 SHRINKAGE RESISTANT GROUT

Shall be a pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland Cement, shrinkage compensating agents, plasticizing and water reducing agents.

Minimum Compressive Strength - ASTM C-109, 6500 psi in 28 days. Maximum Shrinkage - ASTM C-827 and ASTM C-157, shall not exceed 0.5 per cent.

03600.2.7 EPOXY ADHESIVE GROUT

Shall be two component material suitable for use on dry or damp surfaces and shall comply with ASTM C-881. Minimum Pot Life shall be 5 minutes at 70°F. Minimum Tensile strength - ASTM D-638, 5000 psi in 14 days. Minimum Tensile Elongation - ASTM D-638, 2 per cent. Minimum Compressive Strength - ASTM D-695, 6500 psi in 24 hours at 70°F, 12,500 psi in 28 days at 70°F. Maximum Water Absorption - ASTM D-570, 1 percent. Minimum Bond Strength shall be: in Direct Shear - 400 psi; in Direct Tension - 250 psi; in Beam Break - 800 psi.

03600.2.8 MORTAR

Shall be a mixture of grout aggregate, all of which passes the No. 4 sieve size, Portland Cement, hydrated lime, and water blended to form a plastic putty meeting the requirements of ASTM C-270. Mortars for brick or concrete block masonry construction shall be Type S or M, mixed in the proportions indicated in the table shown below and manufactured in accordance with the Uniform Building Code. Type S mortar shall be used in masonry sections above grade and not subject to water submergence. Type M mortar shall be used in locations below grade and/or where water contact potential is high.

MORTAR MIXING PROPORTIONS (by volume)

Mortar	Portland Cement	Hydrated Lime	Clean Sand
Type "S"	1	½	4½
Type "M"	1	0	2½

03600.3 CONSTRUCTION REQUIREMENTS

The Contractor shall prepare and install grout and mortar materials in accordance with these Specifications. The materials shall be mixed in clean containers, which will not allow contamination from deleterious materials. After mixing, the Contractor shall immediately install the grout or mortar. Grout or mortar left unused one hour after mixing shall be discarded.

03600.4 METHOD OF MEASUREMENT

03600.4.1 NO MEASUREMENT

Grout for leveling of structural components, sealing joints and gaps, finishing concrete surfaces, and filling masonry cells for structures shall not be measured separately for payment.

Mortar used for installing brick or concrete masonry units, or for finishing concrete surfaces, shall not be measured separately for payment.

03600.4.2 SEPARATE MEASUREMENT

Grout installed under pressure for filling voids and pockets under footings and supporting sections and for sealing ground water movement shall be measured by the cubic foot of grout injected in place.

03600.5 BASIS OF PAYMENT

The accepted quantities shall be paid for at the contract unit price for:

PAY ITEM	UNIT
Grout *(Description)*	Cubic Foot

SPECIAL PROVISION

CLARIFIER TOPPING GROUT — SECTION SP03600

03600 GENERAL

03600.1 CLARIFIER TOPPING GROUT

03600.1.1 CLARIFIER TOPPING GROUT FILL

This section specifies materials and placement of clarifier topping grout on clarifier basin floors.

a. Grout for topping of clarifier slabs and basin bottoms shall be composed of cement, fine aggregate, water, and admixtures proportioned and mixed as indicated in Section 03050. Coarse aggregate shall not be used in clarifier topping grout. Mix design must be submitted and approved prior to placement of any grout.

b. Topping grout in clarifiers shall contain between 750 and 800 pounds of cement per cubic yard with a maximum water cement ratio of 0.42. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurements shall not be allowed.

c. Topping grout fill shall contain air-entrainment between 3-4%.

d. Sampling and testing shall be in accordance with section 03050.

e. Topping grout used in clarifiers shall contain fiber reinforcing. Fiber shall be 100 percent virgin polypropylene fibrillated fibers specifically manufactured in a blended gradation for use as concrete secondary reinforcement. Fibers shall be added at a rate of 1.5 pounds per cubic yard of concrete. Fibers shall conform to ASTM C 1116 - Fiber-Reinforced Concrete and Shotcrete, Type III.

f. The consistency of grouts shall be necessary to completely fill the space to be grouted for the particular application.

g. The slump for topping grout fill shall be adjusted to match placement and finishing conditions but shall not exceed six (6) inches.

h. Care shall be taken when grout is placed in hot or cold weather conditions. Refer to Section 03300 for hot or cold weather placement requirements.

03600.1.2 CURING MATERIALS

a. Curing materials shall be in accordance with Section 03100 and as recommended by the manufacturer of the curing materials.

03600.1.3 ADHESIVE BONDING MATERIALS

a. An adhesive bonding agent, Ultrabond 2100 or approved equivalent, shall be applied in accordance with the adhesive bond manufacturer's recommendation.

03600.2 EXECUTION

03600.2.1 PRODUCT DELIVERY, STORAGE AND HANDLING

a. Grout shall be stored in accordance with manufacturer's recommendations. After mixing, the Contractor shall immediately place the grout. Grout left unused 60 minutes after mixing shall be discarded.

03600.2.2 GENERAL

a. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the ENGINEER.

b. After base concrete has cured, the surface the grout is to be applied to shall be given a roughened texture by sand blasting, hydro blasting, or similar method to expose the aggregates and produce a surface the grout can bond to. Jackhammers or chipping hammers shall not be used.

c. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.

d. When cementitious grouts are used on concrete surfaces, the concrete surface shall be saturated with water after being roughened and cleaned, for 24 hours prior to placement or as recommended by grout manufacturer. Upon completion of the saturation period, excess water shall be removed with clean, oil free compressed air prior to grouting. The surface shall achieve a saturated surface dry (SSD) condition.

e. Surface preparation, curing, and protection of cement grout shall be in accordance with Section 03100 and as outlined in this special provision.

f. Adhesive bonding agent shall be mixed as directed by the bonding agent manufacturer for no less than 3 minutes. Apply an even coat of the mixed bonding agent to the cleaned surface using a brush, roller, or airless sprayer as directed by the bonding agent manufacturer recommendations. Install grout while bonding agent is still tacky as directed by bonding agent manufacturer.

g. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques, as well as windy or low humidity grouting techniques and precautions if applicable.

h. Topping Grout Fill

1. Mechanical, electrical, and finish WORK shall be completed prior to placement of topping grout fill.

2. The minimum thickness of grout topping fill shall be one-inch.

3. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade (Refer to clarifier manufacturers requirements/O&M Manual for Directions).

4. Topping grout placed on the clarifier slabs shall proceed as outlined in the Grouting Procedure of the O&M Manual provided by Westech Engineering, Inc. for “Two (2) 75’ Diameter COP Mechanisms”. As indicated, start a ring of grout which can be worked by a crew, usually 2’ wide, at the outer edge of the tank. This ring can be gradually widened as it approaches the center of the tank, but in any case, grout should not be allowed to build up in front of the screed. (Refer to the procedures in the Westech O&M Manual for further direction and clarification).

5. As soon as topping grout is completed and set enough to walk on, coat surface with curing compound per Section 03100. After the topping is set and sufficiently hard in clarifiers and where required by the ENGINEER, the tank shall be filled with sufficient water to cover the entire floor for a minimum of 10 days, preferably longer.

04100.1 DESCRIPTION

Includes furnishing materials, anchorage, accessories and labor required to construct walls and structural features of buildings.

04100.1.1 RELATED WORK

Section 03600 - Grout and Mortar

04100.1.2 SUBMITTALS

04100.1.2.1 DRAWINGS - When called for in these Specifications, the Contractor shall furnish drawings of general construction of forms, jointing, location of ties and other items affecting visibility. Where special shapes of brick units, or pre-cast concrete units are shown on the Drawings, the Contractor shall furnish drawings and detail descriptions of these units for approval by the Engineer.

04100.1.2.2 MANUFACTURER'S INFORMATION - Submit name of manufacturer, type, size, grade and color samples of brick units for selection by the Engineer.

04100.1.3 DEFINITIONS

Facing Brick - brick specifically manufactured and finished for exposure in exterior and/or visible wall surfaces.

Building Brick - Some times referred to as "common" brick and specifically designed for use as interior units in structural wall components without exposure.

Flashing - Sheet metal or plastic placed in brick walls to deflect surface water accumulation onto or away from joints with other structural components such as roof surfaces, foundations, etc.

Weep Holes - openings fabricated into the bottom of brick walls to allow drainage of any moisture accumulation inside the wall interior.

Wall Ties - metal connectors placed strategically to connect exterior brick wall veneer sections to interior faces or other structural components.

Lintels - Steel or reinforced concrete units installed horizontally over openings in wall sections to support the brickwork places over the opening.

04100.2 MATERIALS

04100.2.1 FACING BRICK

Shall be manufactured to meet the requirements of ASTM C 216. Unless otherwise indicated on the drawings or in these Specifications, the Contractor shall provide Type FBS, Grade SW, with the color selected by the Engineer.

04100.2.2 BUILDING BRICK

Shall be manufactured to meet the requirements of ASTM C 62 Unless otherwise indicated on the drawings or in these Specifications, the Contractor shall provide Type F, Grade SW with the color selected by the Engineer.

04100.2.3 MORTAR AND GROUT

Shall meet the requirements of Section 03600.

04100.2.4 FLASHINGS

Unless shown otherwise on the Drawings or in these Specifications, all material used for masonry flashings shall be 22 gage (minimum) galvanized steel sheet.

04100.2.5 JOINT REINFORCEMENT

Shall be truss type galvanized steel, with 3/16-inch side rods and No. 9 cross ties.

04100.2.6 WALL TIES

Shall be galvanized bent wire, 0.1875-inch (minimum), but not greater than one-half of the mortar joint thickness.

04100.2.7 REINFORCEMENT

Shall be deformed steel bars of the size shown on the Drawings meeting the requirements for reinforcement steel in Section 03200.

04100.2.8 CONTROL JOINT FILL MATERIAL

Fill material inside control joints shall be sponge rubber, 3/8-inch thick.

04100.2.9 WEEP HOLES

Shall be formed with 5/16-inch (minimum) PVC tubing between brick units on the bottom course.

04100.3 CONSTRUCTION

04100.3.1 MORTAR

With the exception of lime putty, all mortar shall be mixed on the job, and no mixing off the job, either complete or in part, will be allowed. Materials for the mortar mix shall be measured by volume. Mortar shall be mixed in a mechanical mixer and only in such quantities as are needed for immediate use. Mortar shall be mixed for at least five minutes after all materials have been added to the mixer. No mortar which has been mixed for more than one hour shall be used

04100.3.2 HANDLING AND STORAGE OF MASONRY UNITS

All masonry units shall be transported and handled in such manner as to prevent chipping and breakage. Storage piles, stacks, or bins shall be located to protect materials from heavy traffic. Chipped, cracked, or otherwise defective units shall not be laid in the wall where exposed to view.

04100.3.3 LAYING

04100.3.3.1 PREPARATION – Preparations for laying shall include the following:

- The foundation on which a masonry wall is to be built shall have a clean surface. Sandblasting shall be done if there is latent foreign material lodged in the pores of the foundation surface.

- All sills, ledges, offsets and other projections shall be protected from spills or drops of mortar, and all construction by other trades shall be protected from damage which may result from the masonry work.

- Masonry units shall be cured and dried before being used. The surface of all brick shall be clean and free of dust, dirt or other foreign material before laying.

- Depending on the weather and other conditions, the Contractor may be instructed to lay brick masonry units up either wet or dry. Instructions in this regard will be included in the Special Provisions or will be given directly by the Engineer. When instructed to lay the masonry units up wet, at the time of laying all brick shall have been dampened until it reaches an absorption rate of not over 1.4-ounces per minute as determined in accordance with ASTM C-67.

- Before starting work, the mason shall measure the foundation wall and determine the joint..

04100.3.3.2 CONSTRUCTION TOLERANCES - All masonry walls shall be laid in uniform and true courses, level and plumb. Walls shall be plumb within plus or minus ¼-inch per 12 feet. Walls shall be straight horizontally within plus or minus ¼-inch in 50 feet. Wall thickness shall be as shown on the Plans with a tolerance of plus ¼-inch, minus 1/8-inch. Variation from level coursing shall not exceed ¼-inch in 10 feet.

04100.3.3.3 BOND PATTERN - Bond pattern for all masonry walls shall be running bond unless otherwise indicated on the Plans or specified herein. No jumping of bond will be allowed. Bond shall be plumb throughout.

04100.3.3.4 APPLICATION OF MORTAR – Mortar shall be applied as follows:

- Mortar joints shall be straight, cleaned and uniform in thickness and shall be tooled as indicated on the Drawings and/or as herein specified.

- Joint thickness is to be ½-inch both vertical and horizontal, unless otherwise shown.

- Full mortar bedding shall be used for the first course on the foundation. Full mortar coverage shall be provided on the face.

- Vertical head joints shall be well buttered and these joints shall be shoved tightly so that the mortar bonds well to both units.

041003.3.5 PLACEMENT OF MASONRY – Masonry units shall be placed as follows:

- Masonry units shall be laid in the wall to the desired height with joints of uniform thickness.

- Units shall be leveled, plumbed and straightened \before the mortar has stiffened.

- Masonry units shall be adjusted to their final position in the wall while the mortar is still soft and plastic enough to ensure a good bond.

- If the position of the unit is shifted after the mortar has stiffened, or bond is broken or cracks are formed, the unit shall be relayed in new mortar.

- Where fresh masonry joins totally or partially set masonry, the set masonry shall be cleaned before layering new work.

04100.3.3.6 CONSTRUCTING AND GROUTING VERTICAL CELLS – This work shall proceed as follows:

- All masonry shall be laid to preserve the unobstructed vertical continuity of cells to be filled with reinforcement and grout.
- Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 2 inches by 3 inches.
- Walls and cross webs forming such cells to be filled shall be full bedded in mortar to prevent leakage of grout. All head (or end0 joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.
- Vertical reinforcement shall be held in position at the top and bottom and at intervals not exceeding 192 diameters of the reinforcement.
- All vertical cells containing reinforcement shall be filled solidly with grout in lifts not exceeding 4 feet in height.
- When the grouting is to be stopped for one hour or longer, horizontal construction joints shall be formed by stopping the pour of grout 1½" below the top of the uppermost unit.

04100.3.4 BEAMS AND BEARING PLATES

Two courses of grouted hollow masonry shall be provided below all steel bearing plates or beams bearing on masonry walls. Place external bearings on each side of contact with load as required to properly transfer load to the masonry wall, as indicated on the plans.

04100.3.5 OPENINGS

04100.3.5.1 METAL DOORFRAMES - Jambs and heads of metal doorframes connected to masonry shall be anchored and fully grouted. Filling of frames shall be done as each two feet of masonry is laid.

04100.3.5.2 CUTOUTS - All necessary cutting of masonry units to form chases, etc., for anchorage or other appurtenances shall be required. All cutting and fitting of exposed masonry units shall be done with a power driven carborundum or diamond disc blade saw.

Where masonry is to enclose conduits, pipes, stacks, ducts, and similar items, slots, chases, cavities, and similar spaces shall be constructed as required, whether indicated on the plans or not. No such work shall be covered until advised that work has been inspected and tested.

All openings in exterior masonry for pipes, conduits, etc., shall be caulked weather tight with silicone rubber caulking colored to match the mortar.

04100.3.6 COMPLETION AND CLEANUP

At the completion of the work, all holes or defective mortar joints on exposed masonry shall be pointed. Where necessary, defective joints shall be cut out and re-pointed. After completion of the masonry work, all mortar drippings and other foreign substances shall be removed with a stiff brush. All exposed block surfaces shall be thoroughly wetted with clean water and then be uniformly and thoroughly washed down with a solution of one part commercial muriatic acid

mixed with 8 to 10 parts of clean water. The surface shall be brushed with a stiff brush during the washing. The cleaned surface shall be entirely free of streaks and stains of any kind. All material liable to damage shall be protected. Brickwork shall be washed down with clean, fresh water immediately after acid cleaning.

04100.3.7 ANCHORS

Anchorage of intersecting walls, veneer, floor and roof shall be made in accordance with the Uniform Building Code.

04100.3.8 MASONRY FLASHING

Extend flashing through veneer, turn up minimum 8-inches and bed into mortar joints of masonry; seal to substrate as required. Lap end joints minimum 6-inches and seal watertight.

04100.3.9 LINTELS

Where steel or pre-cast concrete lintels are not scheduled, install reinforced unit masonry lintels over all openings as shown on the Drawings or prescribed herein. Construct or shop fabricate masonry lintels of like units, using grout, filled solidly, and reinforcing to properly span opening. Maintain minimum 8-inches bearing on each side of opening. Use reinforcing bars of one-piece lengths only. Place and consolidate grout fill without disturbing reinforcing. Allow lintel construction to reach strength before removing temporary supports.

04100.3.10 CONTROL JOINTS

04100.3.10.1 LOCATION - Control joints with filler shall be located as shown on the Plans or as otherwise specified. Control joints, as detailed, shall be provided at all vertical masonry walls where such walls exceed 40 feet in length. In long lengths of walls, joints shall be provided at least every 30 feet or as indicated on the Plans.

04100.3.10.2 INSTALLATION - Control joints shall be continuous full height of walls. At bond beams, control joints shall separate masonry and grout and horizontal joint reinforcement shall not be continuous. Do not continue horizontal joint reinforcing across control joints.

04100.3.10.3 FILL - Install resilient control joint in continuous lengths Heat or solvent weld butt and corner joints in accordance with manufacturer's instructions. Fill material shall be held back from finished surface and the remainder of the joint shall be caulked with silicone rubber compound with a color which matches the mortar.

04100.3.11 ACCESSORIES

All items as required and/or directed, including all anchors, flashings, sleeves, frames, structural steel, anchor bolts, miscellaneous iron and all other items required shall be set tight and caulked as necessary to seal any exterior joints or contact surfaces. Do not build in organic materials.

04100.3.12 CUTTING AND FITTING

Modify completed work for chases, pipes, conduit, sleeves, grounds and other items as required. Obtain approval prior to modifying any area not indicated or where appearance or strength of masonry work may be impaired. Cooperate with other sections of work to provide correct size, shape and location.

04100.3.13 PATCHING

Patching of exposed masonry units shall be done at the conclusion of the general work and shall be done in such a manner that the patching will be indistinguishable from similar surroundings or adjoining work.

04100.3.14 PROTECTION OF MASONRY WORK

Temporary protection shall be provided for all exposed masonry corners subject to injury. Masonry shall be protected against rapid drying by frequently fogging and sprinkling the work sufficiently that walls will be visibly wet for a period of not less than 3 days.

04100.3.15 COLD WEATHER CONSTRUCTION

Masonry work shall be allowed to proceed in cold weather only when air temperature is maintained at 40° or greater and the following temperatures in masonry components are attained. Heat the mixing water and aggregate to a minimum of 70°F and not over 160°F. The temperature of masonry units shall be at least 35°F when laid. Provide sufficient measures to maintain masonry temperature above 40°F for 24-hours after laying.

04100.3.16 INSULATING FILL IN WALLS

Exterior walls of all buildings which have brick cells that are not filled with grout shall be filled with insulation. Insulation shall be foamed-in-place insulation as specified in Division 7. The cells in the brick wall shall be kept as free of mortar as possible as the masonry goes up. The brick laying shall not be carried more than four feet vertically ahead of the insulation fill. That is, the insulation shall be foamed in place in lifts not to exceed four feet. Care shall be taken that no insulating fill gets into cells which are to be filled with grout and that no grout gets into cells that are to be filled with insulation.

04100.4 METHOD OF MEASUREMENT

Unless provided otherwise in Special Provisions, brick masonry will be measured as part of the building or structure listed in the Bid Schedule and no separate measurement will be made for brick masonry.

04100.5 BASIS OF PAYMENT

Separate payment will not be made for brick masonry unless provided otherwise in the Special Provisions.

05010.1 GENERAL

This section of the Specifications covers metals and metal work required to furnish, fabricate, and to install the following nonexclusive list of items:

- Aluminum and miscellaneous nonferrous metals
- Anchors and anchor bolts
- Bolts
- Cast-iron frames and covers
- Grating and frames
- Ladders
- Louvers
- Manhole frames and covers
- Metal roof decking
- Miscellaneous metal items shown on the Plans or specified
- Miscellaneous structural steel
- Pipe handrails, pipe sleeves, inserts, and chains
- Platforms
- Sheet metalwork
- Special supports, hangers, and anchors
- Stairs and treads
- Steel lintels
- Supports for mechanical equipment
- Tread plates and frames

05010.1.2RELATED WORK

Not used.

05010.1.3 SUBMITTALS

Certified copies, in duplicate, of mill tests or reports from a recognized commercial laboratory shall be furnished when requested as to the chemical, tensile, and bending properties of each shipment of structural metal or part thereof having common properties. All tests and analyses shall be made in accordance with the applicable ASTM Specification.

05010.1.4 DEFINITIONS

Not used.

05010.2 MATERIALS

05010.2.1ALUMINUM

05010.2.1.1 SHEET ALUMINUM - Except as otherwise specified or indicated on the Plans, sheet aluminum shall be alloy 50050H14 conforming to the requirements of ASTM B 209 and shall be not less than 0.025 inch in thickness.

05010.2.1.2 STRUCTURAL ALUMINUM - Structural aluminum shall be 6061-T6, and extruded aluminum shall be 6063-T42.

Aluminum shapes and appurtenant materials shall conform to the requirements of ASTM B 221 and ASTM B 308 and shall be of aluminum alloy known commercially as 6061-T6. Materials not otherwise specified shall conform to the latest applicable Specifications of ASTM.

05010.2.1.3 BOLTS - All bolts for bolting aluminum shall be Type 304 or 316 stainless steel of sizes indicated on the Plans.

05010.2.2STEEL

05010.2.2.1 SHEET STEEL - Galvanized sheet iron or steel shall conform to ASTM A 525, 1.25-ounce coating; black steel to ASTM A 569.

05010.2.2.2 STRUCTURAL STEEL – Structural steel shall be as follows:

- Unless otherwise specified, structural steel shall conform to ASTM A 36.
- Cast iron shall conform to ASTM A 48, Class 40B.
- Galvanized structural steel or iron shall be “hot dipped” galvanized after fabrication. Electro-galvanizing shall not be used unless specified otherwise.
- All structural steel shall be delivered free from mill scale, rust, or pitting.
- Items not galvanized or protected by a shop coat of paint shall be protected from the weather until erection and painting.

05010.2.2.3 STAINLESS STEEL - Stainless steel, unless specifically specified or indicated on the Plans otherwise, shall be Type 316 or Type 304, nonmagnetic.

05010.2.2.4 STEEL PIPE - Steel pipe shall conform to ANSI B 36.10, Table I.

05010.2.2.5 BOLTS - High tensile bolts shall conform to ASTM A 325.

05010.2.2.6 OTHER ITEMS

Other structural and miscellaneous metal items shall be as indicated on the Plans or as specified elsewhere.

05010.3 CONSTRUCTION (FABRICATION) REQUIREMENTS

05010.3.1GENERAL

All structural or foundry items shall be carefully fabricated to true dimensions without warp or twist. Welded closures shall be neatly made; and where weld material interferes with fit or is unsightly in appearance, it shall be ground off smooth.

05010.3.1.1 INSTALLATION - Each structural item shall be installed true to level, plumb, alignment, and grade with all parts bearing or fitting the structure or equipment for which it is intended accurately and securely. It shall not be permitted to cock out of alignment, re-drill, reshape, or force to fit any fabricated item. It is the Contractor’s responsibility to place anchor bolts or other anchoring devices accurately and to make any surfaces, which bear against structural items smooth and true to level to preclude the necessity of any springing, re-drilling, or reshaping.

05010.3.1.2 SPECIAL ALIGNMENT - Pipe railings, posts, and structural items needing a special alignment to preserve straight, level, even, smooth lines shall be rigidly supported and braced and kept braced until concrete, grout, or dry pack cement mortar has hardened for a period of not less than 48 hours.

05010.3.1.3 FIT - The Contractor shall be responsible for the correct fitting of all metalwork in the field. The Contractor shall take all measurements necessary to properly fit its work in the field, and it shall be governed by and be responsible for these measurements and the proper working out of all details.

05010.3.1.4 WELDING – General welding procedures are as follows (see also Subsections below):

- The Contractor shall notify the Engineer at least 24 hours before starting shop or field welding.
- A welding inspector may check the materials, the equipment, and the qualifications of the welders.
- The inspector may use gamma ray, magnetic particle, dye penetrant, trepanning, or any other aid to visual inspection which it may deem necessary to be assured of the adequacy of the welding.
- The costs of any tests and all re-tests on defective welds shall be borne by the Contractor. Cost in connection with qualifying welders shall also be borne by the Contractor.
- The cost of tests on sound welds will be borne by the Owner.
- Welders doing unsatisfactory work shall be removed or may be required to pass qualification tests again.

05010.3.1.5 MISCELLANEOUS METALWORK - Where anchors, connections, or other details of miscellaneous metalwork are not definitely shown or specified, its material, size, form, attachment, and location shall conform to best practice.

05010.3.1.6 HAZARDOUS PROJECTIONS - Sharp or hazardous projections shall be rounded off and ground smooth.

05010.3.1.7 CHIPS AND DEBRIS - All chips and other debris lodged between contacting surfaces shall be removed before assembly.

05010.3.2ALUMINUM

05010.3.2.1 STRUCTURAL ALUMINUM

The Contractor shall furnish and install all structural aluminum items in accordance with the Plans and as specified. It shall provide all supplementary parts necessary to complete each item even though such work is not definitely covered by the Plans and Specifications. Its size, form, attachment, and location shall be such as to conform to the best of current practice.

05010.3.2.2 LAYOUT ON ALUMINUM - Hole centers may be center punched and cutoff lines may be punched or scribed. Center punching and scribing shall not be used where such marks would remain visible on the surface of the fabricated material.

When critical dimensions exist, a temperature correction shall be applied in the layout as necessary. The coefficient of expansion shall be taken as 0.000013 per degree F.

05010.3.2.3 CUTTING AND DRILLING ALUMINUM – Aluminum may be cut and drilled as follows:

- Material 1/2 inch thick or less may be sheared, sawed, or cut with a router. Material more than 1/2 inch thick shall be sawed or routed.

- Cut edges shall be true, smooth, and free from excessive burrs or ragged breaks.
- Edges of plates carrying calculated stresses shall be planed to a depth of 1/4 inch. Sawn or routed edges will be acceptable when the finish is of equal quality to a planed edge.
- Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.
- Rivet or bolt holes may be punched or drilled to finished size before assembly.
- The finished diameter of holes for unfinished bolts shall be not more than 1/16 inch larger than the nominal bolt diameter.
- All holes shall be cylindrical and perpendicular to the principal surface. Holes shall not be drifted in such a manner as to distort the metal.
- Flame cutting of aluminum alloys is not permitted.

05010.3.2.4 ALUMINUM FORMING AND ASSEMBLY - Structural aluminum material may not be heated except in forming operations where material may be heated to a temperature not exceeding 400 degrees F for a period not exceeding 30 minutes to facilitate bending. Such heating shall be done only when proper temperature controls and supervision are provided to insure that the limitations on temperature and time are carefully observed.

05010.3.2.5 WELDING ALUMINUM - This Specification shall apply to both field and shop welding operations. The general recommendations and regulations shown in the American Welding Society Specifications D1.1, "Structural Welding Code," apply to 6061-T6 structures. Detail requirements for welding aluminum alloy 6061-T6 are given as follows:

- Filler metal for welding shall be aluminum alloy welding rods conforming to the requirements of AWS A 5.10 and shall be AWS classification ER 4043, ER 5154, ER 5254, ER 5183, ER 5356, or ER 5556.
- The welding process and welding operators shall both meet a qualification tests. The method of qualification shall conform to the method described in the ASME Boiler and Pressure Vessel Code, Section IX, "Welding Qualifications," Part B. Aluminum alloy 6061-T6 shall be used for the qualification test plates. Operators shall be qualified on the basis on bend tests and a fillet weld soundness test.
- Dirt, grease, forming or machining lubricants, or any organic materials shall be removed from the areas to be welded by cleaning with a suitable solvent or by vapor degreasing. Additional operations to remove the oxide coating just prior to welding are required when the inert gas tungsten arc welding method is used. This may be done by etching or by scratch brushing. The oxide coating may not need to be removed if the welding is done with the automatic or semi-automatic inert gas shielded metal arc.
- Suitable edge preparation to assure 100 percent penetration in butt welds shall be used. Oxygen cutting shall not be used. Sawing, chipping, machining or shearing may be used.
- Any welding of aluminum shall be done using a nonconsumable tungsten electrode with filler metal in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG). No welding process that requires the use of a welding flux shall be used unless prior approval has been obtained from the Engineer. Preheating for welding is permissible provided the temperature does not exceed 400° F for a total time of 30 minutes.

- Welding of any structure which is to be anodized shall be done using filler alloy rods that will not discolor when anodized. ER 5154, ER 5254, ER 5183, ER 5356, or ER 5556 filler alloy rods shall be used.

05010.3.2.6 PROTECTION OF ALUMINUM SURFACES - Aluminum surfaces to be placed in contact with wood, concrete, masonry, or dissimilar metals other than stainless steel shall be protected as specified in the appropriate sections of Division 9 – Finishes.

05010.3.2.7 BOLTING - Where aluminum comes in contact with steel it shall be bolted with stainless steel bolts and separated or isolated from the steel with neoprene gaskets or washers or as specified in Division 9.

05010.3.3 STEEL

05010.3.3.1 STRUCTURAL STEEL – The following shall apply:

- The Contractor shall furnish and install all structural steel items in accordance with the plans and as specified herein.

- The Contractor also shall provide all supplementary parts necessary to complete each item even though such work may not be specifically covered by the Plans and Specifications.

- Wherever applicable, all fabrication and erection of steel items shall conform to AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" except as the same may be modified by applicable building codes, the General Conditions, and these Specifications.

05010.3.3.2 WELDING OF STEEL – Both the general recommendations and regulations shown in the American Welding Society Specifications D1.1, "Structural Welding Code," as well as the detail requirements in those specifications apply to welding of steel structures. Welding of steel shall adhere to the following:

- All welding of steel under this section shall be done by welders who have a current AWS certificate for the type of welding to be done by the welder.

- All welding of structural steel type ASTM A 36 shall be done using mild steel covered Arc Welding Electrodes conforming to ASTM A 233, Series E70, or shall be done using Electrodes and Fluxes for Submerged Arc Welding conforming to ASTM A 558, Classification F70-XXXXX, where XXXXX refers to any electrode referred to in ASTM A 558.

- Welding of stainless steels shall be done with electrodes and techniques as recommended in Welded Austenitic Chromium - Nickel Stainless Steels - Techniques and Properties as published by the International Nickel Company, Inc., New York, New York. All welds shall be full penetration welds, unless specified otherwise.

05010.3.3.3 PROTECTION OF STEELWORK - The Contractor shall paint steel and miscellaneous ferrous metal items as specified in the appropriate sections of Division 9-Finishes.

05010.3.4DUCTWORK

05010.3.4.1 DESIGN AND FABRICATION - Ducts shall be fabricated of aluminum or galvanized steel sheets with gauges of sheet metal, joint types, reinforcing, bracing, supporting, fabricating, installing, and other requirements in accordance with Duct Manual and Sheet Metal Construction

for Ventilating and Air Conditioning Systems of the Sheet Metal and Air Conditioning Contractors National Association, Inc. Ducts shall be designed for the appropriate pressure type as shown in the above mentioned Duct Manual. Details on the Plans in some cases call for sheet metal thicknesses greater than called for in the Duct manual. Sheet metal shall conform to whichever requirement calls for the greater thickness. Aluminum ducting shall be not less than 0.063 inches thick.

05010.3.4.2 HANGERS - Ducts shall be supported on both sides at all changes in direction and at not greater than eight foot intervals by suitable hangers as specified herein or as detailed on the Plans. For galvanized ducting, hangers for ducts 12-inch by 24-inch or smaller shall be galvanized sheet metal straps not lighter than 18-gauge by one inch secured to the structure by one 5/16-inch bolt and to the duct by not less than two No. 10 sheet metal screws or 3/16-inch stove bolts. Hangers for ducts larger than 12-inch by 24-inch shall be galvanized steel straps or rods not less than 0.13 square inches in net cross section, secured to the structure by a Grinnell Figure 152, Size 2, concrete insert, or approved equal, and to a duct pocket or reinforcing angle by two 1/4-inch stove bolts. For aluminum ducting, supports shall be equivalent to supports for galvanized ducting except that all fasteners, fittings, and shafting shall be stainless steel.

05010.3.4.3 FLEXIBLE CONNECTIONS - Where blowers or equipment containing blowers or other machine elements, which may cause vibration, are connected to ducts or housing, such connections shall be by means of flexible connections. These flexible connections shall be airtight at the pressures encountered and be flame proof and water proof. The flexible material shall be equivalent to 14 ounce canvas.

05010.4 METHOD OF MEASUREMENT

Not used.

05010.5 BASIS OF PAYMENT

Not used.

05050.1 DESCRIPTION

This section covers a generic list of miscellaneous metals specifications.

05050.1.1 RELATED WORK

Not used.

05050.1.2 SUBMITTALS

Not used.

05050.1.3 DEFINITIONS

Not used.

05050.2 MATERIALS

05050.2.1 LADDERS AND METAL STAIRS

All ladders shall be safety ladders conforming to OSHA standards. All ladders and stairways supplied to the project shall be of one manufacturer. All stair and ladder wells shall be adequately guarded, and all stairs shall have handrails as specified or shown on the Plans.

Ladders shall be secured to the supporting surface by bent plate chips providing not less than 7 inches between the supporting surface and center of rungs. If exit from the ladder is forward, over the top rung, side rails shall be extended not less than 3-feet-3 inches above, and returned to the landing. If exit from the ladder is to the side, the ladder shall extend not less than 5-feet 6-inches above the landing and be rigidly secured at the top.

05050.2.2 ALUMINUM LADDERS

Aluminum ladders shall be made of 6063-T5-aluminum alloy, of welding construction. Rungs shall be not less than 1-inch square bar with 1/8-inch grooves in the top and redivided edges. Side rails shall be no lighter than 3 inches by 3/8 inches. Ladders shall be of the size, shape, location, and details indicated on the Plans. Ladders greater than 20 feet in height shall have standard ladder cages designed in accordance with State and OSHA requirements. All aluminum surfaces, which will be in contact with concrete, shall be coated as specified in Division 9.

05050.2.3 ALUMINUM STAIRWAYS

Aluminum stairways shall be fabricated and installed as shown on the Plans. Stairway stringers shall be fabricated of aluminum alloy 6061-T6. Treads shall be aluminum as specified below. Handrail shall be fabricated of aluminum pipe as specified under aluminum handrail.

Stair treads shall be aluminum of the sizes called for on the Plans, and shall be of the same type and make as called for under GATING. All fasteners shall be of Type 304 or 316 stainless steel.

Stair treads shall be furnished with cast abrasive type safety nosing.

05050.2.4 ARCHITECTURAL AND MISCELLANEOUS SHEET METAL

Sheet metal flashing and counterflashing shall be installed as indicated on the Plans. Galvanized steel or anodized aluminum flashing shall be used when indicated and specified on the Plans.

Unless otherwise indicated flashing shall be 0.025-inches thick. The aluminum flashing shall receive a 215-R1 anodic finish after fabrication as indicated on the Plans. Exposed edges shall be folded back 1/2-inch to provide stiffness. Except as otherwise indicated and specified on the Plans, counterflash shall be provided over all base flashings.

Unless specifically noted, galvanized steel flashing shall be used in contact with structural steel and anodized aluminum flashing shall be used in contact with structural aluminum. This shall be done to protect against dissimilar metal action.

Surfaces to which sheet metal is to be applied shall be even, smooth, round, thoroughly clean and dry, and free from all defects that might affect the application. All cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed under this section. All accessories or other items essential to the completeness of this sheet metal installation, though not specifically shown or specified, shall also be provided under this section. Nails, screws, and bolts shall be of the types best suited for the intended purpose and shall be of a composition that will not support galvanic action in the installation. Where sheet metal abuts into adjacent materials, the juncture shall be executed in a manner satisfactory to the Engineer.

Sheet metal items not covered elsewhere shall be as indicated on the Drawings and as required to provide a watertight installation. Formed sheet metal for metal covered work shall accurately reproduce the detail and design shown and profiles, bends, and intersections shall be sharp, even, and true.

05050.2.5 ALUMINUM SHEET METAL WORK

Except as otherwise specified or indicated on the Plans, sheet aluminum shall be alloy 5005-H14 conforming to the requirements of ASTM B 209 and shall be not less than 0.025 inch in thickness and extruded aluminum shall be 6063-T42.

05050.2.6 MISCELLANEOUS STRUCTURAL STEEL

Miscellaneous steel items not specified herein shall be as shown on the Plans or specified elsewhere and shall be fabricated and installed in accordance with the best practices of the trade.

05050.2.7 LINTELS

Lintels for masonry construction shall be structural steel beams or angles, fabricated as indicated on the Plans.

05050.2.8 SUBMERGED ASSEMBLY BOLTS

Assembly bolts for wood baffles, collectors, and other assemblies in areas where stainless steel anchor bolts would be required shall be stainless steel bolts Type 304 or 316.

05050.2.9 ANCHOR BOLTS AND INSERTS

Wherever feasible, anchor bolts shall be cast in place when concrete is placed.

All anchor bolts and concrete anchors embedded in concrete shall be accurately spaced with bolts truly normal to the surfaces from which they project. Type 304 or Type 316 stainless steel anchor bolts and nuts shall be used under these circumstances:

- Any time they are submerged in water.

- In the case of structures customarily containing water, placed in walls, ceilings, or overheads, even if above water level.
- In the dry side of water bearing walls.
- Where securing aluminum to steel or concrete.

Anchor bolts not required by above conditions to be of stainless steel, may be of carbon steel conforming to ASTM A 307 or ASTM A 36. Carbon steel anchor bolts in the following locations shall be hot-dip galvanized.

- Anchor bolts exposed to the weather
- In electrical manholes or pull boxes.
- In tunnels, passageways, galleries, vaults, or rooms below grade or enclosed in part by water bearing walls.

In anchoring machinery bases subject to heavy vibration, two nuts shall be used, one serving as a locknut. In all cases where steel anchor bolts are used, a liberal coating of nonoxidizing wax shall be applied to the threads before screwing on nuts.

All bolts, when indicated for future use, shall be first coated thoroughly with nonoxidizing wax, followed by turning nuts down to the full depth of thread. Exposed thread shall then be neatly wrapped with a waterproof polyvinyl tape.

05050.2.10 INSTALLATION

Anchor bolts shall be embedded not less than 12 diameters. Where shown on the Plans, anchor bolts shall be set in metal sleeves having an inside diameter approximately 3 times the bolt diameter and not less than 12-bolt diameters in length. Sleeves shall be filled with grout when the machine or other equipment is grouted.

05050.2.11 CONCRETE ANCHORS

Concrete anchors, where indicated on the Plans or specified, shall mean drilled in place anchors with integral anchor bolts. Concrete anchors shall be Phillips “Wedge Anchors” with integral anchor bolts, or Expansion Products Company “Wej-It” concrete anchors with integral anchor bolts, or approved equal.

The material of each concrete anchor, including its integral anchor bolt, shall be the same material as would be required, under these Specifications, for anchor bolts in the same location that the concrete anchor is to be used.

Concrete anchors shall have the following minimum embedment lengths:

EMBEDMENT OF CONCRETE ANCHORS

Size	Embedment Length
3/8”	1-1/2”
½”	2-1/4”
5/8”	2-3/4”
¾”	3-1/4”

If Wej-It expansion anchors are used they shall have the following minimum embedment length:

WEJ-IT ANCHORS

Size	Embedment Length
¼"	1-1/2"
½"	5"
5/8"	5"
¾"	5"

Anchor bolts, of the same material and size as required for the specified concrete anchors, may be cast in the concrete in lieu of using concrete anchors. Embedment of bolts in concrete shall be not less than 12-bolt diameter plus a standard hook.

No cast iron, lead cinch, or slug-in anchors will be permitted for use.

05050.2.12 MISCELLANEOUS CAST IRON

All castings shall be tough, gray iron, free from cracks, holes, swells, and cold shuts, and be of workmanlike finish, and shall conform to the Standard Details and with the ASTM Specification Designation A 48, Class 40 B. The quality shall be such that a blow from a hammer will produce an indentation on a rectangular edge of the casting without flaking the metal. Before leaving the foundry, all castings shall be thoroughly cleaned and subjected to a hammer inspection, after which they shall receive a coating of coal-tar pitch varnish in such a manner as to form a firm, tenacious coating.

05050.2.13 MANHOLE FRAMES AND COVERS

Manhole frames and covers shall be made from a superior quality gray iron, conforming to the requirements of ASTM A 159, Class G3000, or ASTM A 48, Class 30-B. Frames and covers shall have horizontal and vertical bearing surfaces machined to fit neatly, and the cover shall bear firmly in the frame without rocking and shall be easily removable. Frames and covers shall be heavy-duty traffic type designed for H-20 loading and shall have a combined set weight of at least 360 pounds.

Frames shall have a clear inside opening of 24 inches diameter and shall be of the bottom flange type. Frame height shall be approximately 4½" and bottom flange outside diameter shall be approximately 32 inches.

Covers shall have a skid resistant grid pattern design as recommended ASTM publication STP326.

The elevations at which manhole frames and covers are to be set shall conform to the requirements set forth on the Plans, but in all cases shall be governed by the Engineer in the field. Where the cover is in existing pavement or in the traveled way of the existing road shoulder, it is to be placed flush with the existing surface. Where the structure is outside the limits of the traveled shoulder but not in the roadside ditch, it should be placed 1/10 foot or more above the existing ground surface. Where the manhole cover falls in the existing roadside ditch or right of way, it is to be placed approximately 1-1/2 feet above the existing ground surface or as directed by the Engineer. Manhole frames shall be set at the required grade and shall be securely attached to the top precase manhole shaft unit. After the frames are securely set in the place provided herein, covers shall be installed and all necessary cleaning and scraping of foreign materials from the frames and covers shall be accomplished to ensure a fine satisfactory fit. All costs of setting and securing manhole frame and cover sets in place as herein provided, including all necessary concrete work shall be considered as included in applicable contract unit prices and no additional allowance will be made therefore.

Cast lettering on manhole covers shall be as shown on the Plans. Shop drawings of all manhole rings and covers shall be submitted to the Engineer.

05050.2.14 CAST IRON PRESSURE MANHOLE FRAME AND COVER

The Contractor shall furnish and install, ready for use as indicated on the Plans and as specified herein, rectangular pressure manholes and covers. Each pressure manhole shall have a clear opening of 18" X 30". The pressure plate shall be flat on top and shall not be less than 1/2 inch thick steel and fastened with 316 stainless steel studs and stainless steel nuts. A 1/8-inch thick neoprene gasket shall be supplied between the frame and pressure plate. Lifting shall be provided with a watertight pickhole. The frame shall be a seal-type with flanges at the base and at the top.

05050.2.15 MISCELLANEOUS ALUMINUM

Structural and other metal items fabricated from aluminum, not covered separately herein shall be fabricated in accordance with the best practices of the trade and shall be field assembled by riveting or bolting with no welding or flame cutting permitted except as approved by the Engineer.

05050.2.16 ALUMINUM STAIR NOSING

Stair nosings shall be installed on all treads of all concrete stairs including the top tread of the upper slab. Stair nosings shall be aluminum abrasive cast nosings with aluminum oxide granules integrally cast into the metal forming a permanent nonslip long wearing surface. The nosings shall be Type 101 Stair Tread by Wooster Products, Inc., Spruce Street, Wooster, Ohio 44691, Type A stair treads by American Abrasive Metals Company, or approved equal. The treads shall have integrally cast anchors. Stair nosings shall be cast in fresh concrete and shall be flush with the tread and riser faces. Stair nosing shall be coated with zinc chromate primer in accordance with the provisions of Division 9. Screws shall be 304 or 316 stainless steel.

05050.2.17 MANHOLE STEPS

Manhole steps shall consist of 3/4-inch diameter stainless steel or polyethylene rungs. Rungs shall extend 7-inches from the face of the wall to which they are anchored and shall have a minimum clear width of 16-inches. Rungs shall be designed such that the foot cannot slide off the end. Distance between rungs shall be 12-inches. Rungs shall be hook anchored into walls a minimum of 6-inches.

05050.3 CONSTRUCTION REQUIREMENTS

Not used.

05050.4 METHOD OF MEASUREMENT

Not used.

05050.5 BASIS OF PAYMENT

Not used

05100.1 DESCRIPTION

05100.1.1 Includes furnishing and installing galvanized steel, extruded aluminum, or fiberglass bar grating for commercial or industrial floors and walk ways as shown on the Drawings an in accordance with the requirements described herein.

05100.1.2 RELATED WORK

Not used.

05100.1.3 SUBMITTALS

The Contractor shall provide complete information, which includes shop drawings for fabrication and erection of all work, parts lists, fabrication details, loading tables, anchor details, and manufacturer's installation instructions and details in accordance with the requirements of Section 01300.

With regard to 05100.2.6 – Slip Resistant Surfaces, below, evidence of compliance with the requirements stated there shall be furnished from the grating manufacturer to the Engineer at the time of delivery of the gratings to the Project site.

05100.1.4 DEFINITIONS

Not used.

05100.2 MATERIALS

05100.2.1 GENERAL GRATING REQUIREMENTS

Grating shall be of such bar size and spacing that, as determined by the manufacturer, the grating will support a uniform loading of 180 pounds per square foot on the entire area of the grating, using an extreme fiber stress of not more than 10,000 pounds per square inch. The maximum deflection under this loading will not be more than 1/240 of the clear span of the grating. The spacing of the main grating bars shall not be more than 1-1/8 inches clear between bars. Crossbars shall be at right angles to the main bearing bars, and center to center spacing shall not exceed 4¼ inches. Ends of grating and cutouts shall be banded. Grating shall be of the thickness shown on Drawings or as required by these Specifications. All grating supplied to the project shall be by one manufacturer.

05100.2.2 STEEL BAR GRATING

Shall be machine-welded, galvanized carbon steel bearing bars and cross bars. Bearing bars for steel grating shall be not less than 1-1/2 inches in depth, unless directed otherwise by the Engineer. Spacing of bearing bars and cross bars shall not be less than those required in 05100.1.1.1 above. Span length of the bearing bars shall be in accordance with the information shown on the Drawings. The grating shall in all cases, meet the load and deflection requirements of 05100.1.1.1.

05100.2.3 ALUMINUM GRATING

Shall be I-bar or rectangular bar type grating with bearing bars and cross bars locked together by a swaging process. Bearing bars for aluminum grating shall be not less than 2 inches in depth, unless shown otherwise on the Drawings, or unless directed otherwise by the Engineer. Spacing of bearing bars and crossbars shall be as required in 05100.1.1.1 above. Span length of the

bearing bars shall be in accordance with the information shown on the Drawings. The grating shall in all cases, meet the load and deflection requirements of 05100.1.1.1.

Aluminum grating shall be supported on aluminum shelf angles cast in the concrete as indicated on the Drawings. Gratings, shelf angles, anchors, etc. shall be of 6061-T6 or 6063-T6 aluminum alloy, except that cross bars may be of 6063-T5 aluminum alloy. All surfaces of shelf angles, anchors, etc. to be in contract with concrete shall be coated as specified under Division 9.

05100.2.4 FIBERGLASS GRATING

Shall be constructed of fiberglass strands set in thermoset plastic in a one-piece mold. Glass content shall not exceed more than 35 per-cent by weight. The resin shall be an opaque, fire retardant polyester or vinyl material with a UL classification. The color and mesh pattern shall be indicted on the Drawings. Bearing bars for fiberglass grating shall be not less than 3 inches in depth, unless directed otherwise by the Engineer. Spacing of bearing bars and cross bars shall be the manufacturer's standards, but load capacity and deflection shall meet all requirements of 05100.1.1.1 above. Span length of the bearing bars shall be in accordance with the information shown on the Drawings.

05100.2.5 FLOOR PLATE

Shall be a commercial grade of hot-dipped, galvanized carbon steel or aluminum plating with a raised pattern of surface projections to resist slippage of foot traffic. The size, thickness, span length and pattern configuration shall be as shown on the Drawings but, in no case shall the thickness be less than ¼-inch.

05100.2.6 CAST IRON GRATING

Shall be cast gray iron meeting the requirements of ASTM 48-93, Class 35B of the type and configuration shown on the Drawings. Castings shall be of uniform quality and free from blow holes, smooth and cleaned by shot-blasting. The size, minimum weight, spacing and span length of the grating sections shall be in accordance with the requirements indicated on the Drawings. Gratings located in areas subject to vehicular traffic shall be capable of sustaining standard highway H-20 loads. Bearing surfaces between grating and supporting cast iron frames shall be machined to allow full contact between the grating and fence.

05100.2.7 SLIP RESISTANT SURFACES

When slip resistant surfaces are required by the Drawings or these Specifications, such surfaces shall conform to all applicable OSHA standards and to USDA/FDA requirements for the food and drug industry, when applicable.

05100.3 CONSTRUCTION REQUIREMENTS

05100.3.1 PREPARATION

The Contractor shall carefully prepare the supporting structure to provide a neat fit and unobstructed walking surface in accordance with the Drawings. A clearance of 1/4-inch shall be provided for grating sections to provide easy removal and minimal movement when tread on. Openings for piping or other obtrusions shall be reinforced to support bearing components of the grating.

05100.3.2 Gratings shall be furnished and installed with appropriate clips and/or fasteners as recommended by the grating manufacturer. Supporting frames for grating shall be fabricated from materials which will not contribute to the corrosion or deterioration of the grating and which will provide

uniform support to the grating sections. Grating frames shall be designed to be removable and/or replaceable unless shown otherwise on the Drawings.

05100.3.3 Grating located in areas subject to foot and vehicular traffic shall have opening spaces sufficiently small as to not allow entrapment of bicycle or wheelchair wheels.

05100.3.4 Support for grating sections shall be constructed in full compliance with the recommendations of the grating manufacturer. Openings for piping or other obtrusions shall be properly reinforced to provide support of the bearing components of the grating section.

Except as otherwise specified or shown on the plans, grating shall be supported on shelf angles cast in the concrete as indicated on the plans. All surfaces of shelf angles, rebates, anchors, etc. to be in contact with concrete shall be coated as specified under Division 9.

05100.3.5 The clear opening space for grating section shall provide sufficient space for easy removal of sections; however, it shall not be oversized to allow excessive movement of the sections. Unless otherwise indicated, this clearance space shall be ¼-inch between grating sections and supporting frames. The top surfaces of grating sections adjacent to each other shall be in the same plane.

05100.4 METHOD OF MEASUREMENT

Separate measurement of the floor will not be made when the material is installed as a component of a building or structure listed in the Bid Schedule.

05100.5 BASIS OF PAYMENT

Separate payment will not be made for floor grating included in the measurement of a building or structure in which it is installed.

05400.1 GENERAL

05400.1.1 RELATED DOCUMENTS

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

05400.1.2 SUMMARY

A. This Section includes the following:

1. Exterior non-load-bearing curtain-wall framing.
2. Interior ceiling joist framing for tunnel construction.
3. Gypsum sheathing and air-infiltration barriers.

B. Related Sections include the following:

1. Division 5 Section “Metal Fabrications” for masonry shelf angles and connections.
2. Division 9 Section “Interior & Exterior Finishes” for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

05400.1.3 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

05400.1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: See Structural General Notes

a. Dead Loads: See Structural General Notes
b. Live Loads: See Structural General Notes
c. Roof Loads: See Structural General Notes
d. Snow Loads: See Structural General Notes
e. Wind Loads: See Structural General Notes
f. Earthquake Loads: See Structural General Notes

2. Deflection Limits: Design framing systems to withstand [design loads] without deflections greater than the following:

a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/360 of the wall height.
b. Ceiling Joist Framing: Vertical deflection of 1/3 60 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on

fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).

4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

   a. Upward and downward movement of 1/2 inch (13 mm).

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

05400.1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

   1. Expansion anchors.
   2. Power-actuated anchors.
   3. Mechanical fasteners.
   4. Vertical deflection clips.
   5. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: Evidence of cold-formed metal framing’s compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.

05400.1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Mill certificates signed by steel sheet producer or test reports from a qualified independent testing agency indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and galvanized-coating thickness.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Welding: Qualify procedures and personnel according to AWS Dl.1, "Structural Welding Code--Steel," and AWS Dl .3, "Structural Welding Code--Sheet Steel."

E. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

F. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing:

1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

05400.1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

05400.2 MATERIALS

05400.2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied American Studco, Inc.
2. Angeles Metal Systems.
3. California Expanded Metal Products Co.
4. California Metal Systems, Inc.
5. Clark Steel Framing Industries.

6. Consolidated Fabricators Corp.
7. Consolidated Systems, Inc.
8. Dale Industries, Inc.
9. Design Shapes in Steel.
10. Dietrich Industries, Inc.
11. Knorr Steel Framing Systems.
12. MarinoWare; Div. of Ware Industries, Inc.
13. Scafco Corp.
14. Steel Construction Systems.
15. Steel Developers, LLC.
16. Steeler, Inc.
17. Studco of Hawaii, Inc.
18. Super Stud Building Products, Inc.
19. Unimast, Inc.
20. United Metal Products, Inc.
21. Western Metal Lath.

05400.2.2 MATERIALS

Steel Sheet: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 40 (275)
2. Coating: G90(Z275)

05400.2.3 NON-LOAD-BEARING CURTAIN-WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0478 inch (1.1 mm)
2. Flange Width: 1-5/8 inches (41 mm)

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0478 inch (1.1 mm)
2. Flange Width: 1-1/4 inches (32 mm).

05400.2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and furnish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Hole reinforcing plates.
9. Backer plates.

05400.2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws (limited to interior ceiling framing).

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

D. Epoxy Anchoring System: ASTM C 881-90 epoxy resin base bonding system for concrete meeting requirements of Type IV, Grade 3 epoxy and also meeting AASHTO M 235-90 Type I, Grade 3 epoxy.

E. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: 0.0478 inch (1.1 mm)
2. Flange Width: 1-1/4 inches (32 mm).

05400.2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-2 1035

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Thermal Insulation for Concealed Applications: ASTM C 665, type I, unfaced mineral fiber blankets produced by combining glass or slag fibers with thermosetting resins.

1. Applications:

a. Insulation fill at inaccessible voids within cold formed framing composites.
b. 1/2" nominal x 6" width sill sealer fiberglass under bottom tracks.

05400.2.7 GYPSUM SHEATHING

A. Paper-Surfaced Gypsum Sheathing Board with Water-Resistant Core: ASTM C 79, with water-resistant material incorporated into core and with water-repellent paper bonded to core's face, back, and long edges.

1. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
2. Edge and End Configuration: Square
3. Size: 48 by 96 inches (1219 by 2438 mm)
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Georgia-Pacific Corp.
b. National Gypsum Co.; Gold Bond Building Products Division.
c. USG Corp.; United States Gypsum Co.

05400.2.8 SHEATHING ACCESSORIES

A. Fasteners: Steel drill screws, ASTM C 954, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

B. Elastomeric Sealant: Medium-modulus, neutral-curing silicone sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturers for application indicated, and complying with requirements for elastomeric sealants specified in Division 7 Section “Joint Sealants.”

05400.2.10 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer’s written recommendations and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding. Wire tying of framing members is not permitted; Comply with AWS Dl .3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS Dl .3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

5. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

05400.3 EXECUTION

05400.3.1 EXAMINATION

Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

05400.3.2 PREPARATION

Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

05400.3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Bolt or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS Dl .3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

E. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

05400.3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing:. 32 inches (813 mm)

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm)

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

E. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

F. Install supp1ementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

G. Install horizontal bridging in stud system, spaced 48 inches (1219 mm) apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

H. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

I. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

05400.3.5 NON-LOAD-BEARING CURTAIN-WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm)

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing studs and anchor to primary building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1219 mm) apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (300 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

a. Install solid blocking at centers indicated.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

05400.3.6 GYPSUM SHEATHING INSTALLATION

A. General: Install gypsum sheathing to comply with GA-253 and manufacturer's written instructions.

B. Cut boards at penetrations, edges, and other obstructions of the work; fit tightly against abutting construction, except provide a 3/8-inch (9-mm) setback where non-load-bearing construction abuts structural elements.

C. Coordinate sheathing installation with flashing and joint sealant installation so these materials are installed in the sequence and manner that prevent exterior moisture from passing through completed exterior wall assembly.

D. Apply fasteners so screw heads bear tightly against face of sheathing boards but do not cut into facing.

E. Do not bridge building expansion joints with sheathing; cut and space edges to match spacing of structural support elements.

F. Horizontal Installation: Install 48-inch (1219-mm) wide gypsum sheathing boards horizontally with vertical ends centered over flanges of steel studs. Abut ends and edges of each board with those of adjacent boards. Screw-attach boards at perimeter and within field of board to each steel stud at approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9 mm) from edges and ends of boards.

05400.3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

E. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

05400.4 METHOD OF MEASUREMENT

05400.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

05400.5 BASIS OF PAYMENT

05400.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

05570.1 DESCRIPTION

This section covers furnishing and installing galvanized iron or welded steel pipe posts filled and set in concrete at designated locations shown on the Drawings an in accordance with the requirements described herein.

05570.1.1 RELATED WORK

Not used.

05570.1.2 SUBMITTALS

Not used.

05570.1.3 DEFINITIONS

Not used.

05570.2 MATERIALS

05570.2.1 POSTS

Posts shall consist of Schedule 40, galvanized pipe or welded carbon steel pipe with 3/16-inch (min.) wall thickness. Pipes shall extend 48-inches above the driving surface in which they are set and 36-inches below the driving surface. Diameter shall be as shown on the drawings.

05570.2.2 CONCRETE

Concrete installed in the post interior and surrounding the post shall be Class 2000 Portland cement concrete meeting the requirements of Section 03050 of these Specifications.

05570.3 CONSTRUCTION REQUIREMENTS

The Contractor shall carefully locate the position of the bumper post from information provided on the Drawings and excavate a hole of sufficient diameter and depth to provide at least 4-inches of coverage when filled with concrete.

The posts shall be set plumb and in a position that will not obstruct entry into any doorway to be protected by the post. Following the setting and filling of the post with concrete, a galvanized iron cap will be screwed on the galvanized pipe and/or a steel cap will be welded tightly to the welded steel post and the post will then be cleaned and painted in accordance with Section 09910 of these Specifications with red enamel.

05570.4 METHOD OF MEASUREMENT

Separate measurement of the bumper posts will not be made when they are installed as a component of a building or structure listed in the Bid Schedule. Measurement of the posts will be included with the building or structure which it serves.

05570.5 BASIS OF PAYMENT

Separate payment will not be made for bumper posts included in the measurement of a building or structure in which it is installed.

06100.1 DESCRIPTION

Carpentry shall include furnishing and installing wood, metal, and other materials typically used for wood framed buildings or building components.

06100.1.1 RELATED WORK

Section 08110 – Doors, Frames, and Hardware
Section 08210 - Metal Windows
Section 09910 - Painting

06100.1.2 SUBMITTALS

The Contractor shall submit information which indicates size, grade and source of lumber materials for review and approval by the Engineer. Information which describes materials, thickness, size, model number, manufacturer's name, etc. shall be submitted for review for all other materials, including its fasteners, required to complete the building or its component as shown on the Drawings and described herein. All such information and/or materials shall be submitted in accordance with Section 01300 of these Specifications.

06100.1.3 DEFINITIONS

Not used.

06100.2 MATERIALS

06100.2.1 LUMBER

Lumber materials shall be graded No. 2 or better, Douglas Fir, Pine, or Hemlock and shall be free of warping which will affect the alignment of the structural component in which it is installed. Lumber materials which contain signs of rot, fungus, or termite damage will be rejected. Wood materials installed in direct contact with soils, earth materials or concrete floors or footings shall be pressure treated or foundation grade Redwood.

06100.2.2 LAMINATED STRUCTURES

Laminated structural joists, beams and girders shall be of the size and strength capacity shown on the Drawings and shall be manufactured in accordance with the standards of the American Institute of Timber Construction.

06100.2.3 PLYWOOD

Plywood shall be not less than three ply and of the grade and thickness shown on the Drawings, and manufactured in accordance with the standards of the American Plywood Association.

06100.2.4 EXTERIOR FINISH

Wood materials used for exterior finishing shall be solid wood or exterior plywood or plywood siding of the type and grades shown on the Drawings.

06100.2.5 INTERIOR FINISH

Wood materials used for painted interior finishing shall be finger jointed grade ("Paint Grade") pine. Materials used for interior finishing when coated to show a natural wood grain shall be clear grade solid wood or veneered plywood of the species, type and grade shown on the Drawings. Pressed wood or simulated wood materials will not be acceptable for wood cabinets or naturally finished wood trim.

06100.2.6 METAL FRAMING

Metal framing shall consist of galvanized steel sheet of the gage and dimensions shown on the Drawings and manufactured in accordance with the standards prescribed in the Uniform Building Code. Wood may be substituted for metal, or metal may be substituted for wood framing. However, all framing installed within a building must be either wood or metal, unless shown otherwise on the Drawings.

06100.2.7 WALLBOARD

All wallboard shall be of the size and configuration indicated on the Drawings and of a type consistent with good building practice. Wallboard shall conform to the applicable requirements of the most recent edition of the Uniform Building Code (UBC), Sections 2511, 2512, and 2513, as appropriate, together with associated tables therein.

06100.2.8 HARDWARE

All fasteners, hardware and fittings shall be of the size and configuration indicated on the Drawings and consistent with good building practice. Metal hardware and fittings shall be of a good quality, industrial grade, manufactured for heavy-duty service.

Fasteners shall be as required by the UBC as mentioned in 06100.2.7, above. All metal fasteners (nails, clips, etc.) used on members exposed to wet or exterior conditions shall be galvanized steel, stainless steel or aluminum. Screws for fastening gypsum wallboard shall be corrosion resistant steel.

06100.3 CONSTRUCTION REQUIREMENTS

06100.3.1 CARPENTRY STANDARDS

All carpentry work provided in this Contract shall be performed in accordance with the applicable requirements of the UBC, its current amendments, and any building requirement enforced by any local building authority.

In general, all carpentry shall be performed in a manner that exhibits good quality. All joints shall be cut to fit tight. All load bearing member joints shall cut and fit to provide full bearing and load distributing capability.

06100.3.2 WALLBOARD

Installation of wallboard shall comply with the applicable requirements of UBC Sections 2511, 2512, and 2513. Fastener placement shall conform to Table 25G of the UBC as applicable.

Unless indicated otherwise in these Specifications, in addition to fastening with steel screws, all gypsum wallboard shall be glued at all contacts with framing.

06100.3.3 WOOD PLATES

Wood plates on concrete or masonry walls shall be installed to form a level plane. When necessary, cement grouting will be used to ensure full bedding of the plates.

06100.3.4 CABINETS

Cabinets shall be furnished and installed in conformity to the requirements for "custom" grade as defined by the Architectural Woodwork Institute standards. Shelving in cabinets shall be shall be manufactured so as to be adjustable.

06100.3.5 EXPOSED PLYWOOD EDGES

Exposed edges of plywood paneling around door or vent openings, or at corners, shall be concealed with wood casing. Concealing shall be accomplished with 1/4-inch (minimum thickness) moldings unless shown otherwise on the Drawings.

06100.3.6 VINYL BASE

When not shown otherwise, 2-inch (minimum) width vinyl base shall be installed to close the joint between the floor and wall. Such base material shall be installed by securing with a waterproof adhesive to the wall.

06100.4 METHOD OF MEASUREMENT

Separate measurement will not be made for carpentry. When carpentry is required, its measurement shall be included with the measurement for the building or structure shown in the Bid Schedule.

06100.5 BASIS OF PAYMENT

Payment for carpentry shall be included in the payment for the building or structure as shown in the Bid Schedule.

SPECIAL PROVISION

HIGH DENSITY CROSS-LINKED POLYETHYLENE STORAGE TANKS SECTION 06550SP

06550.1 DESCRIPTION

06550.1.1 This specification covers upright, cylindrical, flat and/or cone bottom tanks molded in one- piece seamless construction by rotational molding. The tanks are designed for above- ground, vertical installation and are capable of containing chemicals at atmospheric pressure. Included are requirements for materials, properties, design, construction, dimensions, tolerances, workmanship, and appearance. Tank capacities are from 375 gallon (1,453 L) up to 16,500 gallon (62,453 L).

06550.1.2 This specification does not cover the design of vessels intended for use at pressures above or below atmospheric conditions. It is also not for vessels intended for use with liquids heated above their flash points, temperatures above 140 degrees Fahrenheit for Type I materials, or temperatures above 130 degrees Fahrenheit for Type II materials (see section 4.1 for material classifications).

06550.2 APPLICABLE DOCUMENTS

ASTM (American Society for Testing and Materials) Standards

- D618 Conditioning Plastics and Electrical Insulating Materials for Testing
- D638 Tensile Properties of Plastics
- D790 Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- D883 Definitions of Terms Relating to Plastics
- D1505 Density of Plastics by the Density-Gradient Technique
- D1525 Test Method for Vicat Softening Temperature of Plastics
- D1693 Test Method for Environmental Stress-Cracking of Ethylene Plastics
- D1998 Standard Specification for Polyethylene Upright Storage Tanks
- D2765 Degree of Crosslinking in Crosslinked Ethylene Plastics as Determined by Solvent Extraction
- D2837 Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- D3892 Practice for Packaging/Packing of Plastics
- F412 Definitions of Terms Relating to Plastic Piping Systems

ARM (Association of Rotational Molders) Standards

- Low Temperature Impact Resistance (Falling Dart Test Procedure)

ANSI Standards

- B-16.5 Pipe Flanges and Flanged Fittings

OSHA Standards

- 29 CFR 1910.106 Occupational Safety and Health Administration, Flammable and Combustible Liquids

IBC CODE

- Uniform Building Code 1997 Edition

06550.3 CHEMICAL COMPATIBILITY

Chemical compatibility shall be according to the following chemical resistance guides:
Pruett, Kenneth M., “Chemical Resistance Guide for Elastomers”, Compass Publications.
Pruett, Kenneth M., “Compass Corrosion Guide II”, Compass Publications.

These references shall be considered as general guidelines only. In many cases, combinations of these chemicals are used in such a way that only the customer (by testing molded product samples) can make a determination in regards to acceptability.

06550.4 CLASSIFICATION

Tanks are classified according to type as follows and it is the responsibility of the purchaser to specify Type I or Type II.

- Type I -Tanks molded from cross-linkable polyethylene resin.
- Type II -Tanks molded from linear polyethylene resin (not cross-linkable resin).

06550.5 MATERIALS

06550.5.1 The material used shall be virgin polyethylene resin as compounded and certified by the manufacturer. Type I tanks shall be made from crosslinked polyethylene resin as manufactured by Phillips 66, or resin of equal physical and chemical properties. Type II tanks shall be made from linear polyethylene resin as manufactured by Exxon Chemical, or resin of equal physical and chemical properties.

All polyethylene resin material shall contain a minimum of a U.V. 8 stabilizer as compounded by the resin manufacturer. Pigments may be added at the purchaser's request, but shall not exceed 0.25% (dry blended) of the total weight.

06550.5.2 Mechanical Properties of Type I tank material:

PROPERTY	ASTM	VALUE
Density (Resin)	D1505	0.938-0.944 g/cc
Tensile (Yield Stress 2”/min)	D638	2600 PSI
Elongation at Break (2”/min.)	D638	400%
ESCR (100% Igepal, Cond. A, F50)	D1693	>1000 hours
ESCR (10% Igepal, Cond. A, F50)	D1693	>1000 hours
Vicat Softening Degrees F. Temperature	D1525	248
Flexural Modulus	D790	100,000 PSI

06550.5.3 Mechanical Properties of Type II tank material:

PROPERTY	ASTM	VALUE
Density (Resin)	D1505	0.940-0.947 g/cc
Tensile (Yield Stress 2”min)	D638	2700 PSI
Elongation at Break (2”/min.)	D638	350%
ESCR (100% Igepal, Cond. A, F50)	D1693	400-1000 hours
ESCR (10% Igepal, Cond. A, F50)	D1693	200-500 hours
Vicat Softening Degrees F. Temperature	D1525	235
Flexural Modulus	D790	97,000-103,000 PSI

06550.6 DESIGN REQUIREMENTS

06550.6.1 The minimum required wall thickness of the cylindrical shell at any fluid level shall be determined by the following equation, but shall not be less than 0.187 in. thick.

$T = P \times O.D./2\,SD = 0.433 \times S.G. \times H \times O.D./2\,SD$
T = wall thickness

SO = hydrostatic design stress, PSI
P = pressure (.433 x S.G. x H), PSI
H = fluid head, ft.
S.G. = specific gravity, g/cm^3
0.0. = outside diameter, in.

06550.6.1.1 The hydrostatic design stress shall be determined by multiplying the hydrostatic design basis, determined by ASTM 02837 using rotationally molded samples, with a service factor selected for the application. The hydrostatic design stress is 600 PSI at 73 degrees Fahrenheit for Type I and Type II materials. In accordance with the formula in 6.1, the tank shall have a stratiform (tapered wall thickness) wall.

06550.6.1.2 The hydrostatic design stress shall be derated for service above 100 degrees Fahrenheit and for mechanical loading of the tank.

06550.6.1.3 The standard design specific gravity shall be 1.5 or 1.9.

06550.6.2 The minimum required wall thickness for the cylinder straight shell must be sufficient to support its own weight in an upright position without any external support. Flat areas shall be provided to allow locating large fittings on the cylinder straight shell.

06550.6.3 The top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall. The top head of tanks with 2000 or more gallons of capacity shall be designed to provide a minimum of 1300 square inches of flat area for fitting locations.

06550.6.4 Tanks with 2000 or more gallons of capacity shall have a minimum of 3 lifting lugs integrally molded into the top head. The lifting lugs shall be designed to allow erection of an empty tank.

06550.6.5 The tank shall be designed to provide a minimum of 4 tie-down lugs integrally molded into the top head. The tie-down lugs shall be designed to allow tank retention in wind and seismic loading situations without tank damage. Refer to section 12.2 for tank tie-down accessories.

06550.7 DIMENSIONS AND TOLERANCES

06550.7.1 All dimensions will be taken with the tank in the vertical position, unfilled. Tank dimensions will represent the exterior measurements.

06550.7.1.1 The tolerance for the outside diameter, including out of roundness, shall be per ASTM 01998.
06550.7.1.2 The tolerance for fitting placements shall be +/- 0.5 in. in elevation and 2 degrees radial at ambient temperature.

06550.8 TEST METHODS

06550.8.1 Test specimens shall be taken from fitting location areas or piggy-back test molds.

06550.8.2 Low Temperature Impact Test

06550.8.2.1 Test specimens shall be conditioned at -40 degrees Fahrenheit for a minimum of 2 hours.

06550.8.2.2 The test specimens shall be impacted in accordance with the standard testing methods as found in ASTM D1998. Test specimens < 112" thickness shall be tested at 100 ft.-lb. Test specimens > 112" thickness shall be tested at 200 ft.-lb.

06550.8.3 Degree of Crosslinking Test (% Gel- Type I Only)

06550.8.3.1 The test method used is to be the o-xlene insoluble fraction (gel test) per ASTM D2765 Method C. This test method is for determination of the ortho-xlene insoluble fraction (gel) of crosslinked polyethylene.

06550.8.3.2 The percent gel level for Type I tanks on the inside 118 in. of the wall shall be a minimum of 65%.

06550.8.4 Ultrasonic Tank Thickness Test

06550.8.4.1 All tanks 2000 gallons or larger shall be measured for tank wall thickness at 6", 1ft., 2ft. and 3ft. on the tank sidewall height at 0° and 180° around the tank circumference with 0° being the tank manway and going counter-clockwise per ANSI standard drafting specifications. A copy of this test report can be ordered when placing the original tank order. All tanks shall meet design thickness requirements and tolerances.

06550.8.4.2 Tanks smaller than 2000 gallons are only periodically measured at the start of a production run or after any design changes. Customers can place an order for tank wall thickness measurements on smaller tank sizes when placing the original order. A copy of the test report will be provided if ordered.

06550.8.5 Hydrostatic Water Test

06550.8.5.1 The hydrostatic water test shall consist of filling the tank to brim full capacity for a minimum of four hours and conducting a visual inspection for leaks. A hydrostatic water test will be conducted if ordered by the customer.

06550.8.6 The tank shall be visually inspected to determine such qualities as are discussed in Section 9.

06550.9 WORKMANSHIP

06550.9.1 The finished tank wall shall be free, as commercially practicable, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking and delaminations that will impair the serviceability of the vessel. Fine bubbles are acceptable with Type II tanks to the degree in which they do not interfere with proper fusion of the resin melt.

06550.9.2 All cut edges where openings are cut into the tanks shall be trimmed smooth.

06550.10 TANK FITTINGS (NOZZLES)

06550.10.1 Fittings -Threaded Bulkhead

06550.10.1.1 Threaded bulkhead fittings are available for below liquid installation depending on the tank diameter and the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius' and flange lines. Consult SII for placement questions. The maximum allowable size for bulkhead fittings placed on a curved sidewall section of tanks 48 in. to 142 in. in diameter is 2 inch size. Tank wall thickness must be considered for bulkhead fitting placement. The maximum wall thickness for each fitting size is shown below.

Fitting Size	Maximum Wall Thickness
½ in.	0.750 in
¾ in.	0.875 in.
1 in.	0.875 in.
1 ¼ in.	0.875 in.
1 ½ in.	0.875 in.
2 in.	1 in.
3 in.	1.125 in. (Flat Surface Only)

06550.10.1.2 The bulkhead fittings shall be constructed of PVC, PP, or other specified material. Gaskets shall be a minimum of ¼" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton♦, or other specified material.

06550.10.2 Fittings -Bolted Double 150 lb. Flange Fittings

06550.10.2.1 Bolted double flange fittings are required for below liquid level installation for sizes above 2 in. depending on the tank diameter and the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius' and flange lines. Consult SII for placement questions. Bolted double flange fittings provide the best strength and sealing characteristics of any tank fitting available. Allowable fittings sizes based on tank diameter for curved surfaces are shown below.

Tank Diameter	Maximum Bolted Fitting Size Allowable
48 in. – 86 in.	3 in.
90 in. – 102 in.	6 in.
120 in. – 142 in.	8 in.

The bolted double flange fittings shall allow tank wall thickness up to 2½ in.

06550.10.2.2 The bolted double flange fitting shall be constructed with 2 ea. 150 lb. flanges, 2 ea. 150 lb. flange gaskets, and the correct number and size of all-thread bolts for the flange specified by the flange manufacturer. The flanges shall be constructed of PVC Type I, Grade I, or other specified material. Gaskets shall be a minimum of ¼" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton♦ or other specified material. There shall be a minimum of 4 ea. full thread bolts. The bolts may have gasketed flanged metal heads or bolt heads encapsulated in Type II polyethylene material. The encapsulated bolt shall be designed to prevent metal exposure to the liquid in the tank and prevent bolt rotation during installation. The polyethylene encapsulation shall fully cover the bolt head and a minimum of ¼" of the threads closest to the bolt head. The polyethylene shall be color coded to distinguish bolt material (white -316 S.S., yellow -Hastelloy C276, red -Monel, green - Titanium). Each encapsulated bolt shall have a gasket to provide a sealing surface against the inner flange.

06550.10.2.3 Standard orientation of bolted double flange fittings shall have bolt holes straddling the principal centerline of the tank in accordance with ANSI/ASME B-16.5 unless otherwise specified.

06550.10.3 Fittings -Bolted Stainless Steel Fittings

06550.10.3.1 Bolted stainless steel fittings are available for below liquid level installation depending on the tank diameter and the placement of the fitting in the tank. Fittings must be placed away from tank knuckle radius' and flange lines. Consult SII for placement questions. Allowable fittings sizes based on tank diameter for curved surfaces are shown below.

Tank Diameter	Maximum Bolted Fitting Size Allowable
48 in.	3 in.
64 in. – 142 in.	4 in.

The bolted stainless steel fittings shall allow tank wall thickness up to 2½ in.

06550.10.3.2 The bolted stainless steel fittings shall be constructed with a minimum of 4 fully threaded 3/8 in. studs. Each fitting shall have two gaskets and two flanges. One gasket shall be compressed between the inside of the tank wall surface and the inside flange of the fitting. The other gasket shall be compressed between the outside tank wall surface and the outside flange of the fitting. The stainless steel fittings come standard with female pipe threads on both the inner and outer flanges. Other threading arrangements may be specified. The fittings shall be constructed of Type 316 stainless steel. Gaskets shall be a minimum of ¼" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton♦ or other specified material.

06550.10.4 Fittings- Siphon Tube Fittings

06550.10.4.1 Siphon tubes may be added to the fittings specified in sections 10.1' 10.2 and 10.3. Siphon tubes will allow these fittings, when used as drainage fittings, to provide better tank drainage.

06550.10.5 Fittings- Snyder Unitized Molded Outlet (SUMOTM) -Patent #5,374,026

06550.10.5.1 The SUMO fitting shall be an integral part of the tank and provide complete drainage of liquid through the sidewall of a flat bottom container without the use of a special support structure or concrete pad. The standard outlet provided is a PVC socket which allows solvent weld PVC pipe attachments at the tank pad level. This option is offered in 4 places (0, 90, 180, 270 degree tank locations) at the tank pad level. It provides a metal reinforcement completely isolated from any chemical attack.

06550.10.5.2 The tank attachment shall be constructed from a PVC schedule 80 male adapter and is standard in 2, 3, 4 or 6 in. sizes on select tank sizes. This provides a schedule 80 pipe socket attachment (Except for the 6 in. size). Other outlet attachments are available in a variety of materials. The fitting orifice shall not be less than schedule 80 interior pipe size per ANSI B36.10-1979. O-rings shall be constructed of 70 +/- 5 durometer Viton♦ or other specified material.

06550.10.6 Fittings -Self-Aligning Threaded Bulkhead

06550.10.6.1 Self-Aligning fittings are available for installation in vapor phase applications on curved surfaces depending on the spherical dome radius and the placement of the fitting on the tank dome. Fittings must be placed away from tank radius'. Consult SII for placement questions. The maximum allowable size for self-aligning fittings placed on a spherical section of the tank is shown below.

Tank Diameter	Maximum Bolted Fitting Size Allowable
45 in. – 48 in.	2 in.
64 in. – 142 in.	3 in.

Tank thickness and fitting angle may need to be considered for self-aligning fitting placement. The maximum thickness and installation angle for fitting sizes are shown below.

Fitting Size	Maximum Angle	Maximum Thickness
1 in.	27 degrees	1.000 in.
2 in.	25 degrees	0.750 in.
3 in.	20 degrees	1.000 in.

06550.10.6.2 The self-aligning fittings shall be constructed of PVC or other specified material. Gaskets shall be a minimum of ¼" thickness and constructed of 40-50 durometer EPDM, 60-70 durometer Viton♦, or other specified material.

06550.10.7 All tank fitting attachments shall be equipped with flexible couplers or other movement provisions provided by the tank customer. The tank will deflect based upon tank loading, chemical temperature, and storage time duration. Tank piping flexible couplers shall be designed to allow 4% design movement. Movement shall be considered to occur both outward in tank radius and downward in fitting elevation from the neutral tank fitting placement.

06550.11 TANK ATTACHMENTS

06550.11.1 Tank Attachments -Sight Level Gage

06550.11.1.1 The sight level gage shall be constructed of flexible PE tubing to allow for tank contraction and expansion due to loading and temperature changes. The level gage shall be connected to the tank with 2 Ea. appropriate ¾" fittings as described in section 10. Each fitting can have valves installed for isolation or drainage purposes.

06550.11.2 Tank Attachments -Float Level Gage

06550.11.2.1 The float level gage shall be constructed of a guided float on the inside of the tank connected to a weight indicator on the exterior of the tank with a ¼" rope. The weighted indicator shall move along inside a clear guide pipe and may be equipped with an optional gallonage indicator board. The gallonage indicator board is made of PVC material and may be attached to the clear guide pipe. The board shall be stenciled with one hundred gallon marks and labeled every five hundred gallons. The level gage shall be connected to the tank at an appropriate tank flat on the tank dome with a 3" threaded bulkhead fittings and held along the tank sidewall with appropriate 1" fittings and stand-off connections.

06550.11.2.2 The float level gage rigid components shall be constructed of PVC or other specified material. The rope shall be constructed of polypropylene or other specified material. Gaskets shall be constructed of EPDM, Viton♦ or other specified material.

06550.11.3 Tank Attachments -Ultrasonic Level Indicator

06550.11.3.1 The ultrasonic level indicator shall consist of a 2 or 3 in., 4- 20 mA output PVC sensor and a 3½ digit display unit. The sensor may be equipped with male pipe threads and be connected to the tank with a PE bulkhead fitting, or the sensor may be Teflon♦ faced and flange bolted to the tank with encapsulated 316 5.5. bolts. The sensor is connected to a display unit that is mounted to the containment tank. The display unit box shall be Nema 4 rated and factory pre-wired for 110 V AC power. All connections shall be labeled to prevent errors in field installation. The display unit is preprogrammed for the tank ordered. The display will show hundreds of gallons (display x 100 = gallons).

06550.11.4 Tank Attachments -Manway and Fill Cap (Non-sealed)

06550.11.4.1 Fill caps are available in a 10 in. vented-threaded style on various tank sizes with a minimum opening diameter of 7.125 in. Cap attachment shall be provided with all standard 10 in. cap placements with a polyurethane cap tie. Check SII specification drawing for availability and position.

06550.11.4.2 Manways are available in an 18 in. vented-threaded style (minimum opening diameter of 16 in.), a 24 in. vented threaded style (minimum opening diameter of 22 in.) and a 24 in. slip fit style (minimum opening diameter of 19.25 in) on various tank sizes. Check SII specification drawing for availability and position.

06550.11.4.3 All caps and manways shall be constructed of polyethylene material.

06550.11.5 Tank Attachments -Bolted Sealed Top Manway

06550.11.5.1 Sealed manways are available in 18, 20 and 24 in. sizes on certain tanks in selected positions. Consult SII for placement positions.

06550.11.5.2 The sealed manway shall be constructed of polyethylene material. The bolts shall be Isoplast♦ or other specified material. The gaskets shall be closed cell, crosslinked polyethylene foam and Viton♦ materials.

06550.11.6 Tank Attachments -Down Pipes and Fill Pipes

06550.11.6.1 Down pipes and fill pipes shall be prepared per the customer approved drawings and specifications. All down pipes and fill pipes shall be supported at 5 ft. maximum intervals with support structures. Standard support structure design shall utilize bulkhead fitting tank attachments. Other optional designs are available. All designs shall be done according to the specific needs of the customer.

06550.11.6.2 All down pipes and fill pipes shall be constructed of PVC or other specified materials.

06550.11.7 Tank Attachments -U-Vents

06550.11.7.1 Each tank must be properly vented for the type of material and flow rates expected. Vents must comply with OSHA 1910.106 (F) (iii) (2) (IV) (9) normal venting for atmospheric tanks or other accepted standard, or shall be as large as the filling or withdrawal connection, whichever is larger but in no case less than 1 in. nominal inside diameter. U-vents are offered in sizes from 1 in. to 6 in. with or without screening. Consult SII for necessary venting and placement information.

06550.11.7.2 All u-vents shall be constructed of PVC or other specified materials.

06550.11.8 Tank Attachments -Flange Adapters

06550.11.8.1 Flange adapters may be purchased as optional equipment to adapt threaded or socket fitting outlets to 150 lb. flange connections for connection to piping system components. Flange adapters are available in PVC, CPVC or other specified materials. Flange adapter construction shall utilize schedule 80 components in sizes ranging from ¾" to 8" depending on material required.

06550.12 TANK ACCESSORIES

06550.12.1 Tank Accessories -Ladders

06550.12.1.1 Ladders shall be constructed of painted mild steel, stainless steel, FRP or other specified material.

06550.12.1.2 Safety cages shall be provided with ladders as optional equipment unless required by OSHA standards.

06550.12.1.3 All ladders shall be designed to meet applicable OSHA standards. Reference: OSHA 2206; 1910.27; fixed ladders.

06550.12.1.4 Ladders must be mounted to the tank to allow for tank expansion and contraction due to temperature and loading changes. All top ladder mounts shall be connected to integrally molded in attachment lugs that allow for tank movement.

06550.12.1.5 Mild steel parts shall be deburred and painted with a chemical resistant enamel paint. 12.2 Tank Accessories -Tie Down Systems

06550.12.2.1 The tie down system shall be designed to withstand 110 MPH wind loads. Tie down systems must meet seismic zone 4 requirements per UBG 1993 code. Any anchor bolts shall be provided by the customer per the instructions and the base plates for the system.

06550.12.2.2 The tie down system shall be offered in either painted mild steel, 304 stainless steel or other materials as specified by customer requirements.

06550.12.2.3 Mild steel parts shall be deburred and painted with chemical resistant enamel paint or galvanized.

06550.12.3 Tank Accessories -Tank Heating Systems

06550.12.3.1 Heating systems for use with polyethylene tanks shall be designed to meet specific requirements such as tank material type, tank size, low ambient temperature, and desired maintenance temperature.

06550.12.3.2 All control components of the heating system shall be mounted in water tight, high impact plastic box(es) with a gasketed cover.

06550.12.3.3 All heating system components shall be Nema 4 rated and factory pre-wired for 110 or 220 VAG. All connections shall be labeled to prevent errors in field installation.

06550.12.3.4 Each control box shall carry a decal attached to the inside surface of the cover, on which an electrical wiring diagram will be printed.

06550.12.3.5 Each control box shall contain two temperature controls. One control shall regulate the maintenance temperature setting and the other control shall regulate the high temperature setting. The maintenance temperature setting should be set at the desired maintenance temperature. The high temperature setting shall be adjusted to 10 degrees above the desired maintenance temperature to a maximum of 130 degrees Fahrenheit. All control systems must be designed with a power off failure mode.

06550.12.3.6 The heating panels shall be designed to wrap around and lie flat against the surface of the tanks. The heating panels shall have a maximum heating density of 0.022 watts per square centimeter. All heating panels and sensor bulbs shall be attached to the tank with 2”wide duct tape. Under no circumstances shall cable type heaters be used with polyethylene tanks.

06550.12.3.7 Insulation used shall be polyurethane foam with a density of 2.0- 3.0 lb./ft ^3 with an "R" value of 8.33/in. The foam shall be applied with a nominal thickness of 2" to all external tank surfaces except the tank bottom shell.

06550.12.3.8 Upon completion of application and curing of the insulation, two full coverage coats of latex mastic coating shall be applied to the surface of the insulation in such manner as to seal the insulation from the outside environment. The latex mastic can be ordered in gray (standard) or white in color.

06550.12.4 Tank Accessories -Equipment Platforms

06550.12.4.1 Equipment platforms shall be mounted on tie down lugs integrally molded into the top head of the tank secured for its intended use. If the equipment platform is being used on a tank with saddle type tie down lugs and supporting a mixer, it is recommended the platform and tank be tied down with a tie down system as described in section 12.2.

06550.12.4.2 Equipment platforms shall be offered in painted mild steel or as specified by customer requirements. Mild steel parts shall be deburred and painted with a chemical resistant enamel paint.

06550.12.5 Tank Accessories -Cone Bottom Tank Stands

06550.12.5.1 Cone Bottom Tank Stands shall be offered in 30 and 45 degree cone styles with rated gross weight capacities for all SII cone bottom tanks. The stands shall be designed for a minimum of 2.4 safety factor accounting for wind and seismic loads. Ratings are based on stands anchored to an appropriate concrete support structure and the tank adequately secured.

06550.12.5.2 Cone bottom tank stands shall be offered in painted mild steel or as specified by customer requirements. Mild steel parts shall be deburred and painted with a chemical resistant enamel paint.

06550.13 MARKING, PACKING AND PACKAGING

06550.13.1 The tanks shall be marked to identify the product, date (month and year) of manufacture, capacity, and serial number. The tank shall be shipped with a 3 of 9, HRI bar code label containing tank description, manufacturing order number, part number, serial number, manufacturer, and date.

06550.13.2 The proper caution or warning signs as prescribed by OSHA standard 29 CFR 1910.106 shall be customer determined and supplied.

06550.13.3 All packing, packaging, and marking provisions ofASTM Practice 03892 shall apply to this standard.

06550.13.4 Customer specified labeling is available.

06550.13.5 Tank shrink wrapping and bagging is available upon customer request.

06550.13.6 All fittings shall be installed, removed and shipped separately.

06550.14 SHIPPING

06550.14.1 Since there are variations in methods of shipping, sirs instruction shall be followed in all cases.

06550.14.2 Consult the SII "Guidelines for Use and Installation" booklet included with your tank for unloading instructions on specific tanks. This booklet can be found attached to the cap or manway area on the inside of the tank. Tanks with capacities of 2000 gallons or more have molded-in lifting lugs provided to assist with tank handling.

06550.14.3 Upon arrival at the destination, the purchaser and/or his agent shall be responsible for inspection for damage in transit. If damage has occurred, a claim should be filed with the carrier by the purchaser, and the manufacturer should be notified prior to the tank being put into service.

06550.15 METHOD OF MEASUREMENT

06550.15.1 Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

06550.15.2 Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured at the unit rates for each item listed.

06550.16 BASIS OF PAYMENT

06550.16.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

06550.16.2 When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Polyethylene Upright Storage Tanks	Each

07160.1 DESCRIPTION

07160.1.1 RELATED DOCUMENTS

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

07160.1.2 SUMMARY

This Section includes the following:

1. Cold-applied, asphalt emulsion dampproofing.

07160.1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including data substantiating that materials comply with requirements for each dampproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.

1. Certification by dampproofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

07160.1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed bituminous dampproofing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from one source and by a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

07160.1.5 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.

B. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

07160.2 MATERIALS

07160.2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cold-Applied, Asphalt Emulsion Dampproofing:

    a. ChemRex, Inc.; Sonnebom Building Products Div.
    b. Euclid Chemical Co.
    c. Kamak Chemical Corporation.
    d. Koppers Industries, Inc.
    e. Meadows: W.R. Meadows, Inc.

07160.2.2 BITUMINOUS DAMPPROOFING

A. General: Provide products recommended by manufacturer for designated application.

1. Odor Elimination: For interior uses, provide type of bituminous dampproofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions.

B. Cold-Applied, Asphalt Emulsion Dampproofing: Asphalt-based emulsions recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.

1. Trowel Grade: Emulsified asphalt mastic, prepared with mineral- colloid emulsifying agents and containing fibers other than asbestos, complying with ASTM D 1227, Type III or IV.

07160.2.3 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

B. Protection Course, Roll Roofing Type: Smooth-surfaced roll roofing, complying with ASTM D 224, Type II.

07160.3 EXECUTION

07160.3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.

C. Prime substrate as recommended by prime materials manufacturer.

D. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

07160.3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.

B. Application: Apply dampproofing to the following surfaces.

1. Interior, below-grade surfaces of masonry walls in contact with earth or other backfill and where space is enclosed on opposite side.

2. Where indicated on the Drawings.

C. Cold-Applied Asphalt Dampproofing: For exterior surfaces, provide either emulsified or cut-back, asphalt dampproofing materials, at Contractor's option. For interior surfaces, provide only emulsified asphalt materials.

D. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is completed.

07160.3.3 COLD-APPLIED, ASPHALT EMULSION DAMPPROOFING

Trowel Grade: Trowel apply a coat of mastic asphalt emulsion dampproofing onto substrate at a minimum rate of 7 gal./100 sq. ft. (2.8 L/sq. m), to produce an average, dry-film thickness of 60 mils (1.5 mm) but not less than 30 mils (0.8 mm) at any point.

07160.3.4 PROTECTION AND CLEANING

Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

07160.3.5 INSTALLATION OF PROTECTION COURSE

General: Install protection course of type indicated over completed-and-cured dampproofing treatment. Comply with dampproofing materials manufacturer's recommendations for method of support or attaching of protection materials. Support with spot application of trowel-grade mastic where not otherwise indicated.

07160.4 METHOD OF MEASUREMENT

07160.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07160.5 BASIS OF PAYMENT

07160.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

07191.1 GENERAL

07191.1.1 SUMMARY

A. Section Includes

1. Sheet and sealant materials to provide a continuous vapor barrier throughout the building envelope.

B. Performance Requirements

1. Materials of this Section shall provide continuity of building enclosure vapor and air barrier:
   a. To seal gaps between building enclosure components and wall and roof opening frames.

07191.1.2 REFERENCES

A. ASTM C 920 - Specification for Elastomeric Joint Sealants.

B. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.

C. FS TT-S-00230 - Sealing Compounds, Synthetic-Rubber Base, Single Component, Chemically Curing.

D. Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

E. ASTM E 84/UBC Standard 8-1 Test Method for Surface-burning characteristics of Building Materials.

F. ASTM D 4397 — Standard specification for Polyethylene sheeting for construction, industrial and agricultural applications.

07191.1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

07191.1.4 QUALITY ASSURANCE

A. Qualifications: Applicator: Company specializing in performing the work of this Section with minimum three years documented experience.

B. Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials and installation.

C. Maintain one copy of document on site.

D. Pre-Installation Conference: Convene one week prior to commencing work of this Section, under provisions of Section 01030.

07191.1.5 DELIVERY, STORAGE, AND HANDLING

Protect sheet materials from exposure to weather and direct sunlight prior to, during and after installation.

07191.1.6 PROJECT/SITE CONDITIONS

Environmental Requirements

1. Do not install solvent curing sealants in enclosed building spaces without ventilation.
2. Maintain temperature and humidity recommended by the materials manufacturers before, during, and after installation.

07191.1.7 SEQUENCING AND SCHEDULING

Sequence Work to permit installation of materials in conjunction with other retardant materials and seals.

07191.2 MATERIALS

07191.2.1 MANUFACTURERS

A. Products: Polyethylene Vapor Retarders:

a. Raven Industries, Inc.
b. Reef Industries, Inc.

2. Fire-Retardant, Reinforced Vapor Retarders:

a. Raven Industries, Inc.
b. Reef Industries, Inc.

07191.2.2 MATERIALS

A. Sheet Retarder Type 1: ASTM D 4397 Clear polyethylene film for installation directly behind gypsum board in exterior roof and wall assemblies, 6 mil thick (concealed locations).

B. Sheet Retarder Type 2: Fire Retardant, Class I, foil-faced with a flame-spread rating not to exceed 25 and a smoke density not to exceed 450 when tested in accordance with UBC Standard No. 8-I ASTM E 84 (exposed locations at attic and some exterior wall locations).

07191.2.5 COMPONENTS

A. Sealants: Sealant Type as recommended by sheet manufacturer.

B. Adhesives: For attachment to steel studs and joists: Compatible with sheet barrier and substrate, permanently non-curing, as recommended by sheet manufacturer.

07191.2.6 ACCESSORIES

A. Tape: Polyethylene or polyester self-adhering type, 2 inch wide, compatible with sheet material.

B. Attachments: For attachment to wood joists and studs - use 1/2" staples through cardboard disc. Staple at 12" O.C.

07191.3 EXECUTION

07191.3.1 EXAMINATION

Verify condition of substrate and adjacent materials under provisions of section 01039.

07191.3.2 PREPARATION

A. Remove loose or foreign matter which might impair installation.

B. Clean and prime substrate surfaces to receive adhesive in accordance with manufacturer's instructions

07191.3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Install materials using 1/2" staples through cardboard discs at 12" O.C.

C. Install sealant in accordance with manufacturer's instructions.

D. Seal Lap joints with vapor resistant tape.

E. Seal horizontal sheets air tight to vertical sheets and all roof penetrations.

F. Vapor retarder is to be air tight and free from holes, tears, and punctures.

G. Seal vapor retarder securely to all penetrations.

07191.4 METHOD OF MEASUREMENT

07191.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07191.5 BASIS OF PAYMENT

07191.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

07210.1 GENERAL

07210.1.1 RELATED DOCUMENTS

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

07210.1.2 SUMMARY

A. This Section includes the following:

1. Foundation wall insulation (supporting backfill).
2. Cavity wall insulation.
3. Concealed building insulation.
4. Metal building insulation system and vapor barrier exposed to plenum areas.
5. Perimeter fire-containment systems - fire safing
6. Vapor retarders.

B. Related Sections include the following:

1. Division 3 Section “Cast-in-Place Concrete.”
2. Division 4 Section “Unit Masonry Assemblies” for insulation installed in cavity walls.

07210.1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

D. Research/Evaluation Reports: For foam-plastic insulation.

07210.1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.

2. Fire-Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

07210.1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

07210.2 PRODUCTS

07210.2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:

a. DiversiFoam Products.
b. Dow Chemical Company.
c. Owens Coming.
d. Tenneco Building Products.
e. Engineer approved equal.

2. Glass-Fiber Insulation:

a. CertainTeed Corporation.
b. Johns Manville Corporation.
c. Knauf Fiber Glass.
d. Owens Coming.

3. Metal Building Roof and Sidewall Systems:

a. Thermal Design, Inc.
b. "Simple Saver Systems" 1-800-255-0776.
c. Engineer approved equal.

4. Perimeter Fire-Containment Systems:

a. United States Gypsum Co.
b. Architect approved equal.

07210.2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

1. Type IV, 1.60 lb/cu. ft. (26 kg/cu. m), unless otherwise indicated.

C. Unfaced Mineral-Fiber Blanket Insulation (for concealed wall applications): ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

D. Unfaced Mineral-Fiber Blanket for application at metal purlin/roofing and sidewall girt systems: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from glass, slag wood or rock wool with maximum flame-spread and smoke-developed indices of 25 and 50 respectively, passing ASTM E 136 for combustion characteristics.

1. Nominal 3-1/2" batt for application directly under metal roofing and siding system.

2. Nominal 6" batt or thicker for application within the roof purlin spacing concealed by proprietary system vapor barrier.

3. Completed system R-value based on 4'-9" member and wall girt spacing of R-30.

07210.2.3 PERIMETER FIRE-CONTAINMENT SYSTEMS

Where indicated for gaps between the perimeter edge of fire-resistance-rated floor and roof/ceiling assemblies, provide a perimeter fire-containment system with the fire-test-response characteristics indicated, as determined by testing identical systems per UBC Standard 26-9 and UL 20709 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Products: Subject to compliance with requirements provide

a. USG Thermafiber SAFB
b. Architect approved equal.

07210.2.4 VAPOR RETARDERS

A. Products: Subject to compliance with requirements, provide one of the following:

B. Polyethylene Vapor Retarder: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ngfPa x s x sq. m).

1. Application: concealed by gypsum wallboard

C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

D. Heavy Duty Fire Retardent, Reinforced Polyethylene Vapor Retarder (nominal 8 mil thickness): 2 outer layers of colored polyethylene film laminated to a woven HDPE 900 denier Skrim and weighing not less than 31 lb./1000 sf (14.1 kg/i 00 sq m) with a maximum permeance rating of 0.02 US perms (11.44 ng/Pa x s x sq m), and a flame-spread and smoke developed indices of not more than 25 and 50 respectively.

1. Application: at interior side of all metal building roofs and sidewalls.

2. Custom sizes: match structural bay widths up to 5000 sf per piece.

3. Color: Super White

07210.2.5 AUXILIARY INSULATING MATERIALS

Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

07210.2.6 INSULATION FASTENERS

Products: Subject to compliance with requirements, provide one of the following:

1. Insulation-Retaining Strapping: Continuous painted steel strapping formed from 0.0 16-inch (0.41-mm) thick galvanized steel sheet, sized as required to hold metal building insulation and vapor retarded securely in place, but not less than 1 inch (25.3 mm) in width.

2. Strap Anchors: Metal roof insulation system manufacturer approved painted self-drilling steel fasteners.

07210.3 EXECUTION

07210.3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for
Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

07210.3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless-steel screens (inside) where openings must be maintained for drainage or ventilation.

07210.3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer’s written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. At metal roof systems and sidewall systems apply multiple layers of insulation to provide complete fill of purlin/girt depth under slight compression.

E. At walls apply multiple layers of insulation to produce thickness indicated, and as required to make up total thickness.

07210.3.4 INSTALLATION OF PERIMETER INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line; 36 inches (915 mm) total piece size.

B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.

C. Protect top surface of horizontal insulation from damage during concrete work by applying protection board.

07210.3.5 INSTALLATION OF CAVITY WALL INSULATION

On units of plastic insulation, install small pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 4 Section "Unit Masonry Assemblies."

2. At wall assemblies indicating metal zee framing, adhesive can be deleted.

07210.3.6 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:

1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically.

D. Place loose-fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic loose-fill insulation, comply with the Cellulose Insulation Manufacturers Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation."

E. Stuff glass-fiber, loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

07210.3.7 INSTALLATION OF PERIMETER FIRE CONTAINMENT SYSTEMS

A. Install perimeter fire-containment blanket systems to completely fill voids in fire rated construction. Cut and piece material as required to comply with manufacturer's recommended installation procedures.

07210.3.8 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated and metal strap systems at roof purlins. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs or one roof purlin bay spacing. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.

C. Seal overlapping joints in vapor retarders with adhesives or vapor-retarder tape according to vapor-retarder manufacturer's instructions. Seal butt joints and fastener penetrations with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

F. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

07210.3.9 PROTECTION

Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

07210.4 METHOD OF MEASUREMENT

Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07210.5 BASIS OF PAYMENT

Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

07465.1 DESCRIPTION

07465.1.1 SUMMARY

A. Section Includes

1. Preformed metal siding system for soffits, fascia and wall panels, with related flashings, trim and accessory components.
2. Building paper back-up over wood or gypsum wallboard sheathed walls.

B. System Description: Preformed and pre-finished metal siding system of horizontal and vertical profile; site assembled.

C. Design Requirements

1. System to accommodate, without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
2. Accommodate positive drainage for moisture entering or condensation occurring within panel system, to exterior.

07465.1.2 REFERENCES

A. ASTM A 153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
B. ASTM A 446 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
C. ASTM A 525 - Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
D. ASTM D 226 - Specification for Asphalt-Saturated Organic Felt used in Roofing and Waterproofing.
E. ASTM D 2244 - Test Method for calculation of color differences from instrumentally measured color coordinates.

07465.1.3 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, and methods of anchorage.

C. Submit manufacturer’s recommended installation method showing all requirements for panel installation, sealant application and substructural connections.

D. Submit manufacturer’s suggested material handling and material protection requirements.

E. Submit applicable sample warranties of products.

F. Samples: Submit one sample of siding, siding finish, 12” long by actual width illustrating finish color, sheen and texture.

07465.1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
2. Installer: Company specializing in performing the Work of this section approved by manufacturer.

B. Mock-Up

1. Provide mockup of soffit and fascia system under provisions of Section 01400.
2. Assembly to illustrate component assembly including panel materials, weep drainage system, attachments, anchors and perimeter sealant.
3. Upon acceptance, Mockup may remain as part of the Work.

C. Pre-Installation Conference

1. Convene one week prior to commencing Work of this section, under provisions of Section 01030.

07465.1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01580.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Stack pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

D. Prevent contact with materials which may cause discoloration or staining.

07465.1.6 PROJECT/SITE CONDITIONS

Field Measurements: Verify that field measurements are as indicated on shop drawings.

07465.1.7 SEQUENCING AND SCHEDULING

Coordinate work under provisions of Section 01030.

07465.1.8 EXTENDED WARRANTY

A. Provide under provisions of Section 01700.

B. Special Project Warranty: Submit a written warranty, executed by siding manufacturer, agreeing to repair or replace siding that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 color-difference units as measured according to ASTM D 2244.

C. Warranty Period: 20 years from date of Substantial Completion.

07465.2 MATERIALS

07465.2.1 MANUFACTURERS

A. Fascia Panels and Wall Panels: MBCI Product: Artisan L-8 with Beads

B. Soffit Panels: MBCI Product: Artisan L-8 with beads, perforated, mfg. Color as selected by Owner.

C. Substitutions: Under provisions of Section 01600.

07465.2.2 MATERIALS

Exterior Sheet Materials

1. Pre-coated Galvanized Steel: ASTM A 446, G90 zinc coating; 2 shop pre-coated with Kynar 500 finish coating.
2. Color: as selected by Owner.

07465.2.3 COMPONENTS

A. Fascia and Soffit Panels: Minimum 24 gage thick pre-coated steel, profile as specified; 12 inch wide panels; interlocking edges, perforated where indicated on Drawings.

B. Internal and External Corners: Minimum 24 gage thick pre-coated steel; profile to suit system; brake-formed to required angles.

C. Trim, Closure Pieces, Caps, and Flashing: Minimum 24 gage thick pre-coated steel; brake-formed to required profiles.

D. Anchors: Galvanized steel, refinished where exposed to view.

E. Metal Hat Channels: 22 gage minimum, 7/8 inch high, 2-11/16 inch wide hot-dip galvanized hat channels.

07465.2.6 ACCESSORIES

A. Gaskets: Manufacturer’s standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant; color as selected.

B. Sealants: Manufacturer’s standard type suitable for use with installation of system; non-shrinking and non-sagging; ultra-violet and ozone resistant; color as selected.

C. Fasteners: Manufacturer’s standard type to suit application; steel, hot dip galvanized in accordance with ASTM A 153; fasteners to be concealed.

D. Field Touch-up Paint: As recommended by panel manufacturer.

E. Building Paper: ASTM D 226, 15 pound unperforated asphalt felt.

07465.2.7 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practical lengths.

07465.3 EXECUTION

07465.3.1 EXAMINATION

A. Verify substrate framing under provisions of Section 01030.

B. Verify that building framing members are ready to receive panel system.

07465.3.2 INSTALLATION

A. Building Paper

1. Install one layer building paper horizontally on fascia to receive metal siding.
2. Weather lap edges 6 inches and ends 6 inches, minimum.
3. Securely staple in place.

B. Fascia and Soffit

1. Install metal siding system on fascia and soffits as detailed, and in accordance with manufacturer's instructions.
2. Fasten siding to structural supports; aligned, level, and plumb.
3. Provide backing at perimeter of all penetrations.
4. Locate joints over supports. End lap minimum 2 inches.
5. Use concealed fasteners for soffit and fascia panels and trims.
6. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.
7. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
8. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.
9. Joints in fascia and soffit are to align within maximum 1/8" of each other.

07465.3.3 CLEANING

A. Clean work under provisions of 01700.

B. Remove site cuttings from finish surfaces.

C. Clean and wash pre-finished surfaces with mild soap and water, rinse with clean water.

07465.4 METHOD OF MEASUREMENT

07465.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07465.5 BASIS OF PAYMENT

07465.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

07500.1 DESCRIPTION

Includes furnishing and installing lightweight fiberglass or foam insulation in buildings or enclosures as shown on the Drawings an in accordance with the requirements described herein.

07500.1.1 RELATED WORK

Not used.

07500.1.2 SUBMITTALS

The Contractor shall provide complete information which includes complete product description and manufacturer's installation instructions in accordance with the requirements of Section 01300.

07500.1.3 DEFINITIONS

Not used.

07500.2 MATERIALS

07500.2.1 FOAM

Foam insulation materials shall be Styrofoam brand insulation board, or approved equal, with a thermal resistance rating (R-Value) per inch of five (5) and a capability of being submerged in water and not absorbing more than 0.1% water by volume.

07500.2.2 FIBER

Fiber insulation materials shall consist of long, resilient glass fibers bonded with a thermosetting resin in batts faced with foil and kraft paper facing which enables the product to carry a fire hazard classification rating of 25/50 or less per ASTM E 84. Unless called for otherwise, the thermal resistance and material shall be Corning, 6", R-19.

07500.3 CONSTRUCTION REQUIREMENTS

The type, application and installation of either insulation material will be as shown on the Drawings.

07500.3.1 PREPARATION AND INSTALLATION

The Contractor shall carefully prepare the supporting structure to provide a neat fit for the insulation material in accordance with its manufacturer's recommendations. Appropriate anchor devices or procedures shall be provided to retain the insulation in proper position as recommended by the manufacturer.

07500.3.2 DUCT INSTALLATION

New supply ductwork shall be insulated with 1-pound density, 1-inch thick, fiberglass blanket insulation having aluminum foil reinforced facing complete with vapor barrier. Insulation shall be secured to the sheet metal with clips and adhesive as recommended by the insulation manufacturer. Insulation shall be fitted to the duct surfaces with all joints tightly butted together and against standing seams. All joints and/or holes shall be vapor sealed using an adhesive compound as recommended by the insulation manufacturer.

07500.4 METHOD OF MEASUREMENT

Separate measurement of thermal insulation will not be made when the material is installed as a component of a building or structure listed in the Bid Schedule. Measurement will be included with the building or structure which it serves.

07500.5 BASIS OF PAYMENT

Separate payment will not be made for thermal insulation included in the measurement of a building or structure in which it is installed.

07611.1 DESCRIPTION

07611.1.1 SUMMARY

Section Includes

1. Pre-coated steel roofing, accessories and associated flashings.
2. Counterflashings
3. Roof insulation.
4. Snow guards.
5. Pre-manufactured roof curbs.
6. Installation of deck tite flashings supplied by others.

07611.1.2 REFERENCES

A. ASTM A 653/A 653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the hot dip process.
B. NAAMM - Metal Finish Handbook.
C. NRCA (National Roofing Contractors Association) - Roofing Manual.
D. SMACNA - Architectural Sheet Metal Manual. “Fourth Edition’.
E. ASTM D 2244 – Test Method for calculation of color differences from instrumentally measured color coordinates.
F. ASTM D 4214 - Test Method for evaluating degree of chalking of exterior paint films.

07611.1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 01300.

B. Indicate on shop drawings material profile, jointing pattern, jointing details, fastening methods, sealants, underlayment, and installation details.

C. Shop drawings are to be approved by manufacturer.

D. Submit engineering data, prepared by a licensed engineer registered in the State of Utah, showing all conditions to meet a UL 90 rating.

E. Submit documentation indicating manufacturer’s certification of On Site Installer.

07611.1.4 QUALITY ASSURANCE

Installer: Company specializing in sheet metal roof installations with a minimum of three years documented experience. On Site Installer must be a manufacturer certified installer prior to beginning of work.

07611.1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site, store and protect under provisions of Section 01580.

B. Stack preformed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials during storage which may cause discoloration or staining.

07611.1.6 EXTENDED WARRANTY

A. Under provisions of Section 01700.

B. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

1. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
2. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
3. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

C. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

D. Special Installers Warranty: Provide installer's extended warranty for a period of two (2) years from date of Substantial Completion.

E. Failures include, but are not limited to, the following:

1. Structural failures.
2. Loose parts.
3. Wrinkling or buckling.
4. Failure to remain weathertight, including uncontrolled water leakage.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering, including nonuniformity of color or finish.
6. Galvanic action between sheet metal roofing and dissimilar materials.

F. Warranty Period: Two (2) years from date of Substantial Completion – provide warranty equal to MBCI Standard, Plus 2 Warranty.

07611.1.7 MAINTENANCE

Extra stock: Not Used. RT 2- PRODUCTS

07611.2 MATERIALS

07611.2.1 MANUFACTURERS

A. Roofing System

1. MBCI Product: Super Lok
2. BHP Steel Building Products, USA Product: Zip Rib

B. Substitutions: Under provisions of Section 01600.

07611.2.2 MATERIALS

A. Zinc-coated (Galvanized) Steel Sheet: ASTM A 653/A 653M - G90 structural quality Grade 50, Grade D structural strength zinc coating; 24 gage over solid deck, 24 gauge over 2" girts or purlins, core steel, shop pre-coated with Kynar 500 coating (embossed finish). Color to be selected by Architect.
B. Roof Panel Coverage: 16 inches.
C. Vapor Retarder: As specified in Section 07191.

07611.2.3 ACCESSORIES

A. Fasteners: Galvanized steel with neoprene washers. Finish exposed fasteners same as flashing metal.
B. Sealant: As recommended by manufacturer.
C. Bedding Compound: As recommended by manufacturer.
D. Reglets: Recessed type, pre-finished steel.
E. Supports for Subframing and Blocking: As required by manufacturer.
F. Snow Guards: As detailed.
G. Underlayment: 30 lb., asphalt impregnated felt.
H. Valley and Eave Membrane: Equal to Ice and Water Shield as manufactured by Grace Construction Products, .040 mil.
I. Deck Tite Flashings: installed by this Division, provided by Division 15.
J. Ridge vent, custom fabricated: As detailed.

07611.2.8 FABRICATION

A. Shop Assembly

1. Form sections true to shape, accurate in size, square, and free from distortion or defects.
2. Fabricate cleats of same material as sheet, interlockable with sheet.
3. Fabricate starter strips of same material as sheet, continuous, interlockable with sheet.
4. Form pieces in longest practical lengths.
5. Hem exposed edges on underside 1/2 inch; miter and seam corners.
6. Form material with locking standing seams.

B. Shop Finishing

1. All roofing, flashings, curbs and accessories are to be pre-coated with Kynar 500 finish.
2. Color: As selected by Owner from Manufacturer's Standard Colors.

07611.3 EXECUTION

07611.3.1 EXAMINATION

A. Inspect roof deck to verify deck or substrate is clean and smooth, free of depressions, waves, or projections, properly sloped to valley and eaves.

B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, and reglets are in place.

C. Beginning of installation means acceptance of existing conditions.

07611.3.2 PREPARATION

A. Coordinate site conditions prior to fabricating work.

B. Install starter and edge strips, and cleats before starting installation.

C. Install reglets true to lines and levels.

D. Protect elements surrounding work of this Section from damage or disfigurement.

07611.3.3 INSTALLATION

A. Conform to drawings and shop drawings.

B. Install valley and eave membrane, to width of 5'-8", along entire length of eaves. End laps shall be 6" minimum and side laps shall be 3½ minimum.

C. Install valley and eave membrane 6' wide, centered on valley. Shingle-lap membrane length of valley. End laps shall be 6" minimum and side laps shall be 3½" minimum.

D. Apply underlayment over entire roof deck, if required by manufacturer as a part of the roof assembly. Provide 6" minimum side and end laps.

E. Standing Seam Roofing and Insulation

1. Installation is to be in strict compliance with manufacturer's requirements and details for a 20 year warranty.
2. Any deviation from published manufacturer's installation must be approved in writing from the manufacturer's representative and received by Architect prior to work proceeding.
3. All components of the roofing system are to be modified as required to accommodate insulation thickness.

F. Snow Guards:

1. Provide snow guards as indicated on Drawings.
2. Penetrations:
   a. All penetrations are to be coordinated so that no standing seams are compromised. Deck-Tite flashings shall be installed in center of roof panels.

07611.3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01400.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

C. A representative of the roofing manufacturer is to perform an on-site inspection during installation and of the completed system and certify, in writing, that the system has been installed per manufacturer's requirements and as required for 20-year warranty.

D. Contractor shall immediately correct identified defects or irregularities.

07611.4 METHOD OF MEASUREMENT

07611.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07611.5 BASIS OF PAYMENT

07611.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

SHEET METAL FLASHING AND TRIM — SECTION 07620

07620.1 DESCRIPTION

07620.1.1 SUMMARY

Section Includes

1. Parapet Coping and Cap Flashings, complete with all accessories.
2. Reglets and Miscellaneous exposed metal trim arid flashings.
3. Brick, masonry, and foundation flashings.

07620.1.2 REFERENCES

A. ASTM A *653/A 653M* - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zing-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
B. SMACNA – Architectural Sheet Metal Manual.

07620.1.3 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01300.
B. Describe material profile, jointing pattern, jointing details, fastening methods, sealant methods, and installation details.
C. Verify Leg lengths will extend to finish material surfaces.

07620.1.4 QUALITY ASSURANCE

Qualifications

1. Applicator: Company specializing in sheet metal flashing work with three years minimum experience. Comply with SMACNA's "Architectural Sheet Metal Manual".

07620.1.5 EXTENDED WARRANTY

A. Under provisions of Section 01700.
B. Provide 20 year warranty for degradation of metal finish.

07620.1.6 MAINTENANCE - NOT USED.

07620.2 MATERIALS

07620.2.1 Zinc-coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, 690 coating designation, structural quality; 24 gage steel, shop pre-coated with Kynar 500 coating to match metal roofing.

07620.2.2 Fasteners: Stainless steel with soft neoprene washers at exposed fasteners. Finish exposed fasteners same as flashing metal.

07620.2.3 Sealant: Type specified in Section 07900. Color to match metal finish.

07620.2.4 Protective Backing Paint: Bituminous – cold applied asphalt mastic, SSPC-Paint 12, compounded for 15 mil dry film thickness per coat.

07620.2.5 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
B. Fabricate cleats and starter strips of same material as sheet, minimum six inches wide, interlockable with sheet.

C. Form pieces in longest practical lengths.
D. Hem exposed edges on underside 1/2 inch; miter and seam corners.
E. Form material with flat lock seam.
F. Caulk metal joints with sealant.
G. Fabricate vertical faces with bottom edge formed outward 1/2 inch and hemmed to form drip.

07620.3 EXECUTION

07620.3.1 EXAMINATION

Beginning of installation means acceptance of existing conditions.

07620.3.2 PREPARATION

Field measure site conditions prior to fabricating work.

07620.3.3 INSTALLATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install reglets true to lines and levels. Seal top of reglets with sealant.

C. Install copings and trim true to lines and levels.

D. Seal Metal Joints watertight.

E. Install all materials as recommended by the manufacturer to eliminate all irregularities, including oil canning.

07620.4 METHOD OF MEASUREMENT

07620.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07620.5 BASIS OF PAYMENT

07620.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

07631.1 DESCRIPTION

07631.1.1 SUMMARY

A. Section Includes

1. Pre-coated Galvanized steel gutters and downspouts.
2. Pre-cast concrete splash blocks.

07631.1.2 REFERENCES

A. ASTM A *653/A* 653M - Specification for Steel Sheet, Zinc Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galyannealed) by the Hot-Dip Process, Structural (Physical) Quality.
B. ASTM B 32 - Specification for Solder Metal.
C. ASTM B 486 - Paste Solder.
D. FS O-F-506 - Flux, Soldering, Paste and Liquid.
E. PS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
F. SMACNA - Architectural Sheet Metal Manual.

07631.1.3 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Shop Drawings: Indicate profiles, locations, configurations, joint methods, fastening methods, locations, ~id installation details.
C. Product Data: Provide data on prefabricated components.
D. Samples: Submit color samples.

07631.1.4 QUALITY ASSURANCE

A. Conform to SMACNA Manual for components.

07631.1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01580.
B. Stack preformed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

07631.1.6 EXTENDED WARRANTY

A. Under provisions of Section 01700.
B. Provide 20 year warranty for degradation of metal finish.

07631.2 MATERIALS

07631.2.1 Zinc-Coated (Galvanized) Steel: ASTM A 653/ A 653M — G90 coating designation, structural quality; core steel, shop pre-coated with Kynar 500 coating of color as selected to match roofing.

07631.2.2 Apply bituminous protective backing on surfaces in contact with dissimilar metals/materials.

07631.2.3 COMPONENTS

A. Gutters: SMACNA Rectangular style profile F with bronze wire ball downspout striner, laptype expansion joints.

B. Downspouts: SMACNA Rectangular.
C. Accessories: Profiled to suit gutters and downspouts.

07631.2.4 ACCESSORIES

A. Anchorage Devices: SMACNA requirements.
B. Gutter Supports: Concealed Straps.
C. Downspout Supports: Brackets or Straps.
D. Fasteners: Stainless steel, with soft neoprene washers. Finish exposed fasteners same as flashing metal.
E. Primer: Zinc chromate type.
F. Protective Back Coating: FS TT-C-494, bituminous.

07631.2.5 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.
B. Fabricate with required connection pieces.
C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
D. Hem exposed edges of metal.
E. Fabricate gutter and downspout accessories; seal watertight.
F. Coordinate connection with steel downspout extensions.

07631.3 EXECUTION

07631.3.1 EXAMINATION

Verify that surfaces are ready to receive work.

07631.3.2 PREPARATION

Apply bituminous protective backing on surfaces in contact with dissimilar materials.

07631.3.3 INSTALLATION

A. Install gutters, downspouts, and accessories as indicated.
B. Join length with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
C. Slope gutters to downspouts 1/16 inch per foot.
D. Provide 1” expansion joint at high point of gutter midway between adjacent downspouts.
E. Seal metal joints watertight.
F. Provide splash blocks under each downspout.

07631.4 METHOD OF MEASUREMENT

07631.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

07631.5 BASIS OF PAYMENT

07631.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

07700.1 DESCRIPTION

This section covers furnishing and installing built-up or shingle roofing and metal roofing systems on buildings or enclosures as shown on the Drawings and in accordance with the requirements described herein.

07700.1.1 RELATED WORK

Not used.

07700.1.2 SUBMITTALS

The Contractor shall provide complete information which includes complete material description and manufacturer's installation instructions in accordance with the requirements of Section 01300.

07700.1.3 DEFINITIONS

Not used.

07700.2 MATERIALS

07700.2.1 ASPHALT CEMENT AND COATING

Asphalt cement and coating applied for bonding shall be Type I or II per ASTM D 312 with a flash point not less than 475^0 F. The material shall be heated just enough to achieve softening suitable for application while not producing an excess of fumes.

07700.2.2 FELT MEMBRANES

Shall be organic asphalt felt paper (#15 Plain 15 lb.) and heavyweight saturated organic felt paper (Heavy-duty 40 lb.).

07700.2.3 SHINGLES

Shall be organic asphalt, self-tabbing shingles with a 25 year limited warranty, Class “C” fire rating and a minimum weight of 225 pounds per square.

07700.2.4 FLASHING

Shall be 18 gage (min.) aluminum or galvanized steel sheet. Edging materials shall be aluminum or galvanized steel sheet and shall match the metal type used for the roof fascia covering, if any.

07700.2.5 NAILS

Shall be galvanized roofing nails with a minimum length of 1 1/2-inch.

07700.2.6 GRAVEL COVERING

Shall be 3/8-inch (max.) washed pea gravel.

07700.2.7 CAULKING

Shall be a good quality flexible roof sealant which can be applied under pressure with a standard hand operated caulking gun.

07700.2.8 METAL ROOFING AND RIDGE CAP

Consists of a 26-gauge spanline profile painted metal roofing and fastened with rubber washer galvanized roofing screws of sufficient length to penetrate the sheathing. Color shall be determined by the Engineer.

07700.3 CONSTRUCTION REQUIREMENTS

07700.3.1 PREPARATION

The Contractor shall carefully clean and prepare the roof surface in accordance with its manufacturer's recommendations. Roofing materials shall then be applied as follows:

07700.3.2 EDGING

Edging applied along the lower edge of the roof shall be set so that the base sheet extends over the upper edge of the edging strip to prevent any water from entering under the edging strip

07700.3.3 FLASHING

Flashing shall be installed with the upstream edges tucked under the asphalt shingles and the downstream edge always laid above the shingle layers. The upstream edge of all flashing and edges of overlapping shingles shall be caulked with a continuous strip of caulk. Flashing in valleys on the roof shall be extended at least 8-inches under the shingle layers on the sides.

07700.3.4 BUILT-UP ROOFING

Consists of a base sheet (40 LB felt membrane) laid directly on the roof sheathing and/or insulation. This sheet shall be fastened with roofing nails of sufficient length to fully penetrate the roof sheathing and placed at a spacing not to exceed 12-inches on center. Three layers of #15 plain felt paper will then be applied over the base sheet with hot asphalt cement. Following the application of the 15 lb. Felt paper, a heavy layer of asphalt coating shall then be applied and gravel shall be uniformly distributed over the surface at an application rate of 400 lbs. per 100 square feet.

07700.3.5 SHINGLED ROOFING

Consists of a 40 lb. base sheet applied directly on the roof sheathing and fastened along the edges with roofing nails of sufficient length to penetrate the sheathing. Edge nailing will be done at a spacing of not more than 8-inches on center. Following the application of the base sheet, shingles will be applied in accordance with the instructions of the manufacturer.

07700.3.6 METAL ROOFING AND RIDGE CAP

All installation and spacing of screws will be completed to manufacturer's specifications.

07700.4 METHOD OF MEASUREMENT

Separate measurement for roofing materials will not be made when the material is installed as a component of a building or structure listed in the Bid Schedule. Measurement will be included with the building or structure which it serves.

07700.5 BASIS OF PAYMENT

Separate payment will not be made for roofing materials included in the measurement of a building or structure on which it is installed.

SPECIAL PAINTING — SECTION 09911SP

09911.1 DESCRIPTION

09911.1.1 Provide all labor, materials, supervision, tools, equipment and incidental items required to install the following coating systems for the listed specific areas and components of the Treatment Plant and Lift Station.

09911.1.2 RELATED SECTIONS

Section 09910 – Painting
Section 096724 – Seamless Flooring System
Section 099113 – Exterior Painting
Section 099123 – Interior Painting

See Part 2 – Architectural Sections for interior, exterior, and flooring requirements.

09911.1.3 SUBMITTALS

09911.1.3.1 The CONTRACTOR shall submit for review, complete information for the coating systems described in this section. The information shall clearly describe the materials and their finishes. Such information shall be delivered to the ENGINEER before the CONTRACTOR requests the delivery of the materials.

09911.1.3.2 All information shall be provided in accordance with Section 01300 and written evidence of compliance shall be provided with each delivery of material.

09911.1.3.3 All materials not specified within this Special Provision shall be painted according to Section 09910 - Painting of the Standard Specifications

09911.2 MATERIALS

09911.2.1 Materials specified are those that have been evaluated for the specific service. Products of the Tnemec Company, Inc. are listed to establish a minimum standard of quality. Equivalent materials of other manufacturers may be submitted on written approval of the Engineer. As part of the proof of quality, the Engineer may require at the cost of the Contractor, certified test reports from a nationally known, reputable and independent testing laboratory conducting comparative tests as directed by the Engineer between the product specified and the requested substitution. All requests for substitution shall include manufacturer's literature for each product giving name, product number, and generic type, descriptive information, solids by volume, recommended dry film thickness and certified lab test reports showing results to equal the performance criteria of the products specified herein.

Any material savings from an approved equal substitute product shall be passed to the Owner in the form of a contract dollar reduction.

09911.2.2 CONCRETE STRUCTURES – The concrete structures in and around the treatment plant shall be coated, according to the coating limits, using Tnemec Series 218 Mortar Clad concrete surfacer followed by Tnemic Series 104 H.S. Epoxy. All break lines shall be straight with no overspray.

Structure	Coating Limits
BNR Splitter Box	The entire interior surface of the box as well as the top horizontal surface of the wall shall be coated.

Clarifier Splitter Box	The entire interior surface of the box as well as the top horizontal surface of the wall shall be coated.
Treatment Plant Open Trenches	The entire interior surface of the trench to the top of the trench shall be coated (this shall include the grit chamber interior surfaces).
IFAS Basins	The interior surface of the clarifier beginning 3 ft below the water level extending to the top of the vertical wall and to the outside edge of the horizontal top of wall surface shall be coated.
Clarifier Tanks	The interior surface of the clarifier beginning 3 ft below the water level extending to the top of the vertical wall and to the outside edge of the horizontal top of wall surface shall be coated.
Digester Tank	The interior surface beginning where the vertical wall meets the floor extending to the top of the vertical wall and to the outside edge of the horizontal top of wall surface shall be coated.
Manholes	The entire interior surface of manholes shall be coated.

09911.2.2.1 CONCRETE SURFACER – The concrete surfacer shall be Tnemec Series 218 Mortar Clad. This material is an epoxy modified concrete.

09911.2.2.1.1 Properties

Components	3
Solids by Weight	100%

09911.2.2.1.2 Application Requirements

Equipment	Mortar Hawk, Trowels
Number of Coats	1
Coat Thickness	1/16” minimum
Min. Application Temp.	50 degrees F
Max. Application Temp.	90 degrees F
Cure Time @ 75 degrees F	3-4 hr to touch
Time to Recoat	12-18 hours minimum.

09911.2.2.2 FINISH COATING – The Finish coating shall be Tnemic Series 104 H.S. Epoxy. This material is a Cycloaliphatic Amine Epoxy.

09911.2.2.2.1 Properties

Finish	Semi Gloss

Selected Color	Owner Selected
Components	2
Solids by Weight	82 ± 2% (mixed)
Primer	Self Priming on Concrete or Steel

09911.2.2.2.2 Application Requirements

Equipment	Air or Airless Sprayer, Brush, Roller*
Number of Coats	2 minimum
Dry Film Thickness	4 – 10 mils per coat
Total Dry Film Thickness	10 mils minimum
Min. Application Temp.	60 degrees F
Max. Application Temp.	135 degrees F
Cure Time @ 75 degrees F	6 hours at 4 mils to handle 10 hours at 10 mils to handle 16-18 hours to recoat. 7 days to immersion.

09911.2.3 TREATMENT PLANT FLOORS – The treatment plant floors shall be coated using Tnemic Series 280 Tneme-Glaze. This material is a Polyamine Epoxy. This system is a glaze like corrosion resistant coating that is resistant to frequent pressurized hot water and detergent cleaning. Unless noted otherwise on the Drawings, it is intended that this system shall be installed on all floors in all rooms of the treatment plant except the treatment plant laboratory, control room/office, and restroom.

09911.2.3.1 Properties

Finish	Gloss
Selected Color	Owner Selected
Components	2
Solids by Weight	98 ± 2% (mixed)
Primer	Self Priming on Concrete
Temperature Resistance	(Dry) Continuous 250, Intermittent 275 (degrees F)

09911.2.3.2 Application Requirements

Equipment	Airless Spray, Brush, Roller
Number of Coats	2 minimum
Dry Film Thickness	6 – 8 mils per coat
Total Dry Film Thickness	12 mils minimum
Min. Application Temp.	70 degrees F
Max. Application Temp.	90 degrees F
Cure Time @ 75 degrees F	4 - 8 hours to touch 8 - 18 hours to handle Between 8 and 24 hours to recoat. 7 days to immersion.

09911.2.4 INTERIOR SHEET ROCK AND PLYWOOD SURFACES – Unless specifically specified otherwise on the Drawings, the treatment plant and lift station sheet rock wall and ceiling surfaces, and exposed plywood finished wall and ceiling surfaces (excluding plywood above exposed steel joists or trusses) shall be coated using Tnemic Series 29 Tufcryl. This material is an Acrylic Polymer. Sheet rock surfaces shall be primed with Tnemic Series 51-792 PVA Sealer, and plywood surfaces and wood moldings shall be primed with Tnemic Series 36-603 Undercoater.

09911.2.4.1 PVA Sealer Properties

Finish	N/A
Color	White
Components	1
Solids by Weight	28 ± 2% (mixed)
Primer	N/A

09911.2.4.2 PVA Sealer Application Requirements

Equipment	Air or Airless Sprayer, Brush, Roller
Number of Coats	1 minimum
Dry Film Thickness	1 – 2 mils per coat
Total Dry Film Thickness	1 mil minimum
Min. Application Temp.	50 degrees F
Max. Application Temp.	120 degrees F
Cure Time @ 75 degrees F	0.5 hours to touch 1 hour to handle 3 hours to recoat

09911.2.4.3 Undercoater Properties

Finish	N/A
Color	White
Components	1
Solids by Weight	56 ± 2% (mixed)
Primer	N/A

09911.2.4.4 Undercoater Application Requirements

Equipment	Air or Airless Sprayer, Brush, Roller
Number of Coats	1 minimum
Dry Film Thickness	2 – 3 mils per coat
Total Dry Film Thickness	2 mils minimum
Min. Application Temp.	40 degrees F
Max. Application Temp.	120 degrees F
Cure Time @ 75 degrees F	6 hours to handle 16 hours to recoat.

09911.2.4.5 Tufcryl Properties

Finish	Semi Gloss
Selected Color	PA18 Light Amber
Components	1
Solids by Weight	37 ± 2% (mixed)
Primer	As noted above for wood and sheet rock surfaces

09911.2.4.6 Tufcryl Application Requirements

Equipment	Air or Airless Sprayer, Brush, Roller
Number of Coats	2 minimum*
Dry Film Thickness	1.5 – 2 mils per coat
Total Dry Film Thickness	3 mils minimum
Min. Application Temp.	50 degrees F

Max. Application Temp.	120 degrees F
Cure Time @ 75 degrees F	1 hour to touch
	2 hours to handle
	2 hours to recoat.

* The coating must completely cover the primer and the surface appearance must reasonably match finish on adjacent masonry block, excluding texture of block.

09911.2.5 EXPOSED PROCESS PIPING – The treatment plant and lift station process piping except stainless steel piping and copper compressed air piping shall be coated using Tnemic Series 66 Hi Build Epoxoline. This material is a Polyamide Epoxy.

In addition to painting, each process pipe will be stenciled with an identification label that includes the contained fluid and the direction of flow. The stencil lettering and arrows shall be black, and the paint used for the stencils shall be Tnemic Series 66 Hi Build Epoxoline unless approved otherwise by the Engineer in writing. Stencils for 3 inch pipe and larger shall be 1½ inch high centered on the pipe as viewed by the operator standing on the floor. Stencils for pipe smaller than 3 inch shall be ½ inch high centered on the pipe as viewed by the operator standing the floor. Spacing between stencils shall be 8 feet maximum, and no run of pipe more than 8 feet in length shall be left without a stencil. Adhesive labels and arrows may be used in lieu of painted stencils with written approval of the Engineer. However, prior to approval, the Contractor shall provide submittal information proving that the adhesive labels will not loosen or peal away from the surface to which they are attached under periodic high temperature pressure wash conditions. In addition, the markings on the labels shall not degrade under similar conditions.

09911.2.5.1 Properties

Finish	Satin
Selected Color	See Color Chart for Process Piping Below
Components	2
Solids by Weight	56 $\pm$ 2% (mixed)
Primer	Self Priming on Concrete or Steel

09911.2.5.2 Application Requirements

Equipment	Air or Airless Sprayer, Brush, Roller
Number of Coats	2 minimum
Dry Film Thickness	3 – 5 mils per coat: Primer
Dry Film Thickness	4 – 6 mils per coat: Intermediate or Topcoat
Total Dry Film Thickness	7 mils minimum
Min. Application Temp.	50 degrees F
Max. Application Temp.	135 degrees F
Cure Time @ 75 degrees F	2 hours to touch
	10 hours to handle
	12 hours to recoat.

PROCESS PIPING COLOR CODE TABLE	
Recirculated Activated Sludge (RAS)	39BR Brown Bag It (Light Brown)
Waste Activated Sludge (WAS)	42BR Chocolate (Dark Brown)
Wastewater	39BR Brown Bag It (Light Brown)
Process Water (Disinfected)	18BL Water Front (Light Blue)
Potable Water	20BL Splash (Dark Blue)
Blower Air	Do Not Paint
Compressed Air (Service Air)	Bare Copper Pipe

Polymer Feed	04SF Tangerine Orange Safety (Orange) with 35GN Garden (Dark Green) band 2 inches wide at 4 feet on center
Gas Piping	SC09 Safety Red (Red)

09911.2.6 CLARIFIER AND IFAS EQUIPMENT

The equipment to be included within the clarifier and IFAS structures will be delivered by the manufacturer already coated or painted. Any damage including scratches, pock marks, etc., to the coatings must be repaired per the manufacturer's specification.

09911.3 CONSTRUCTION REQUIREMENTS

09911.3.1 INSTALLATION

Application of all painting systems in this specification shall be done in strict accordance with the recommendations of the coating manufacturer, including surface preparations prior to each system coat. The manufacturer or his representative shall certify all applicators before the materials are applied. The manufacturer or his representative shall be available to assist the on site Engineer's and the Owner's representatives with verification that surface preparation requirements are met Surface preparation before initial coat and between each coat for each system must be approved. DFT of each system coat shall be confirmed in the presence of the ENGINEER before the next coat is applied.

09911.4 METHOD OF MEASUREMENT

09911.4.1 NO MEASUREMENT – Separate measurement for painting will not be made when painting is included as part of an item, building, or structure.

09911.4.2 SEPARATE MEASUREMENT – Separate measurement for painting will be made as a lump sum when painting is listed as a separate item in the Bid Schedule.

09911.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT PRICE
Paint (*Item Description*)	Lump Sum

10175.1 DESCRIPTION

Includes furnishing and installing gas operated unit space heaters and their controls in designated buildings and equipment enclosures in accordance with the Drawings and these Specifications.

10175.1.1 RELATED WORK

Section 16010 - General Electrical Requirements

10175.1.2 SUBMITTALS

The Contractor shall provide complete information which includes cutaway drawings, parts lists, power requirements, heating capacity and manufacturer's installation instructions in accordance with the requirements of Section 01300.

10175.1.3 DEFINITIONS

Not used.

10175.2 MATERIALS

10175.2.1 FORCED AIR HEATER

Shall be a new unit with an enclosed motor, heat exchanger and fan fabricated from heavy gauge metals which are moisture and corrosion resistant as described on the Drawings. Gas heaters shall be AGA gas certified units and approved by the local gas supplier. Heat exchangers shall have all electric welded construction with 18 gauge (min.) tubes and 16 gauge (min.) header plates of aluminized steel.

All unit heaters shall have adjustable louvers for proper air diffusion and shall be fitted with the following:

- Low voltage combination gas valve containing main and pilot gas cocks,
- Main and pilot gas pressure regulators,
- Redundant solenoid gas valves,
- Pilot solenoid gas valve and 100% safety shut-off, and
- Fan control.

10175.2.2 BURNERS

Shall be made of 18 gauge aluminized steel with type 430 stainless steel ribbon inserts and shall fire directly into the heat exchanger tubes.

10175.2.3 CABINET SIDE PANELS

Shall be of 20 gauge cold rolled steel (minimum) and drain pans of 20 gauge-aluminized steel (minimum).

10175.2.4 MOUNTING BRACKETS

Heaters shall be provided with either wall or ceiling mounting brackets as required.

10175.2.5 FAN MOTORS

Shall be equipped with thermal overheat protection.

10175.2.6 CONTROL OF FORCED AIR HEATERS

Shall be provided thermostatically with the thermostat located on the heater or wall mounted in an efficient location that can be easily operated in the building. Thermostats shall be low voltage, mercury types. All heater units shall be UL listed and shall be manufactured in compliance with NEC and OSHA standards.

10175.3 CONSTRUCTION REQUIREMENTS

Gas heaters shall be furnished and installed in accordance with NEC, OSHA, applicable local requirements and the manufacturer's instructions.

10175.4 METHOD OF MEASUREMENT

10175.4.1 Separate measurement for heaters will not be made when they are furnished and installed as components in a building or enclosure separately identified in the Bid Schedule.

10175.4.2 Separate measurement will be made for heaters furnished and installed only when they are installed as replacement or additional items identified in the Bid Schedule.

10175.5 BASIS OF PAYMENT

10175.5.1 Separate payment for heaters will not be made for heaters furnished and installed as equipment in a building or enclosure identified in the Bid Schedule.

10175.5.2 When furnished and installed separately and shown in the Bid Schedule, the accepted quantity for Gas Space Heaters will be paid for at the contract unit price shown in the Bid Schedule for:

PAY ITEM	UNIT
Install *(Size) (Type)* Space Heater	Each
Replace *(Size) (Type)* Space Heater	Each

10210.1 DESCRIPTION

The Contractor shall furnish and install fans, louvers, dampers, and ventilators in designated buildings and equipment enclosures in accordance with the Drawings and these Specifications.

10210.1.1 RELATED WORK

Section 10125 - Electric Space Heaters
Section 16010 - Electrical System Requirements

10210.1.2 SUBMITTALS

The Contractor shall provide complete information, which includes cutaway drawings, parts lists, and capacity and manufacturer's installation instructions in accordance with the requirements of Section 01300.

10210.1.3 DEFINITIONS

Not used.

10210.2 MATERIALS

10210.2.1 QUALITY CONTROL

This specification is not intended to be exclusive or limit competition, but rather to set forth the minimum standards for quality and performance. The Owner reserves the right to reject substitutions if in his opinion, the proposed substitutions will not achieve comparable equipment installation and performance standards.

10210.2.2 FANS

10210.2.2.1 WALL FANS - Wall fans shall be new, wall mounted, direct drive fans, mounted in a screened aluminum or steel frame suitable for mounting in an exterior opening. The fan propeller shall be statically and dynamically balanced cast aluminum, rated in accordance with the Air Movement and Control Association (AMCA), Certified Ratings Program, and fitted with ball type bearings. The fan shall have a spun steel venturi/wall base, and a heavy-duty steel power assembly. The fan shall also include an all aluminum motor operated backdraft damper and a ¼ inch by ¼ inch mesh 16 gauge aluminum screen on the inlet, and corrosion resistant fasteners.

The screening shall be removable for maintenance of the motor, and the unit shall be fitted with flanges around the exterior perimeter, which can provide a weather tight fit without additional moldings. The fan motor shall be capable of operating at standard power supply voltages from 110 through 480 volt, single phase or three phase as specified. All wall fans shall be UL listed and shall be manufactured in compliance with NEC and OSHA standards. Noise levels shall not exceed the maximum limits of Section 11010 of these Specifications.

When the Drawings call for wall fans and louvers to be mounted in wall openings, the louvers will typically be installed on the wall exterior to protect the fan. Both the louvers and the fan units should be removable or coordinated for convenient maintenance. Power actuated louvers shall be connected such that they open automatically when the fan is energized.

10210.2.2.2 TUBE FANS - Tube fans shall be new, direct drive, tube type fan units capable of being mounted directly in a circular pipe duct. The fan motor and housing shall be fabricated from corrosion

resistant steel, aluminum, or plastic and shall be capable of operating in both a vertical or horizontal orientation. The fan propeller shall be rated in accordance with the AMCA Certified Ratings Program. The fan shall have straightening vanes, which are heliarc welded at the discharge side of the unit to eliminate turbulence. The fan shall have a pre-wired twist lock disconnect, and the motor shall be out of the air-stream. The fan wheel shall incorporate true airfoil blades, which are heliarc welded to the hub with non-overloading characteristics. The fan support bracket shall include an extruded rubber isolator. The fan motor shall use ball bearings and shall be capable of operating on a 110 through 480 volt, single phase or three phase standard power supply, as specified. All tube fans shall be UL listed and shall be manufactured in compliance with NEC and OSHA standards. Noise levels shall not exceed the maximum limits of Section 11010 of these Specifications.

10210.2.3 LOUVERS AND DAMPERS

10210.2.3.1 MECHANICALLY OPERATED LOUVERS - Mechanically operated louvers shall be the type and size shown on the Drawings, and shall be as manufactured by the Airolite Company, Penn Ventilator Company, Vent Products Company, Inc., or approved equal. The frame and blades shall be 0.080 6063T5 extruded aluminum, with a standard mill finish, and the frames shall be formed to fit the openings. Blades shall be accurately fitted and firmly secured to the frames. The edges of all louver blades shall be folded or beaded for rigidity. The louvers shall include blade edge seals, and a flange mounting system, unless otherwise shown on the Drawings. Axles shall be ½-inch minimum diameter x 2-inch long plated steel rods. Bearings shall be ½-inch minimum diameter nylon. All louvers and dampers shall be furnished with ¼-inch by ¼-inch mesh 16-gauge aluminum bird screens in a standard folded frame, installed on the inside face of fixed louvers, on outside face for adjustable or automatic louvers, unless shown otherwise on the Drawings. Unless specified otherwise, mechanically operated louvers shall close automatically when the fan is not operating. Louvers shall receive a Class I anodized coating.

10210.2.3.2 POWERED LOUVERS - Where powered operators are required, the louvers shall be fully equipped and set up with the powered operators installed. Powered operators shall be sized as shown on the drawings and shall be as manufactured by Barber Coleman, or approved equal.

10210.2.3.3 FIXED LOUVERS - Galvanized steel fixed louvers shall be a complete factory assembled unit with stationary blades welded securely to the frame and of the size and configuration shown on the Drawings. Louvers shall be fabricated from 10 gauge galvanized steel sheet and fit with a #10 copper alloy insect screen soldered to the inside surface of the louvered opening. Unless shown otherwise in the CONTRACT DOCUMENTS, painting of galvanized louvers will not be required.

10210.2.3.4 DOOR LOUVERS - Door louvers shall be complete factory assembled, adjustable steel (19 gauge min.) door louvers with manually operated shutters, which can be closed tight. The louvers shall be fit with mounting brackets, which form a tight fit around the opening in the door. The louver shall incorporate a factory installed coating system. The color shall be as selected and approved by the OWNER. The louver shall be the model, size and configuration shown on the Drawings. When no size is shown on the Drawings, door louvers shall be 12 inches by 24 inches.

10210.2.4 ROOF VENTILATORS

10210.2.4.1 POWERED ROOF VENTILATORS - Powered roof ventilators for attic ventilation shall operate automatically on a thermostat that can be adjusted between 60°F and 120°F. The ventilators shall be sized as shown on the Drawings. The units shall include built-in safety firestats in the thermostat housings that will automatically shut off power to the units if the temperature reaches or exceeds 170°F, to prevent the vent from drawing in more air in the event of a fire. The units shall be of all metal construction of either galvanized steel, aluminum, or both. No plastic domes or flashing plates shall be used. The units shall incorporate an integral screen of 1/8-inch mesh

maximum, to keep out birds and large insects. Appropriate flashing and lap cement shall be installed to ensure that the vents are fully weatherproof.

10210.2.4.2 WIND DRIVEN TURBINES - Wind driven turbine roof ventilators installed to remove hot attic air and to prevent condensation under winter conditions, shall be 12-inch internally braced turbine ventilators, as shown on the Drawings. Ventilators shall be constructed of 24-gauge galvanized steel with an aluminum painted finish, and shall have ribbed blades for added strength. Turbine ventilators shall use hard chrome plated DuPont Delrin bearing systems, or approved equal. The ventilator shall be supplied with an integral automatic damper, designed to fit inside the 12-inch turbine base and turbine with base units. The damper shall be fully open at 90°F and shall be fully closed at 50°F. When installed on pitched roofs the ventilator shall employ an angle adjustable base, which will allow the ventilator to be installed with the axis of ventilator rotation plumb. Appropriate flashing and lap cement shall be installed to ensure that the vents are fully weatherproof.

10210.2.5 TURBINE VENTILATORS FOR ROOM VENTILATION

Wind driven turbine roof ventilators installed to circulate and vent warm air out of building spaces shall be 12-inch internally braced turbine ventilators, as shown on the Drawings. Ventilators shall be constructed of 24-gauge galvanized steel with an aluminum painted finish, and shall have ribbed blades for added strength. Turbine ventilators shall use hard chrome plated DuPont Delrin bearing systems, or approved equal. The ventilator shall be supplied with an integral thermally actuated automatic damper, designed to fit inside the 12-inch turbine base and turbine with base units. The damper shall be fully open at 90°F and shall be fully closed at 50°F. When installed on pitched roofs the ventilator shall employ an angle adjustable base, which will allow the ventilator to be installed with the axis of ventilator rotation plumb. Turbine roof ventilators used for room ventilation shall incorporate ductwork through the roof, attic spaces and ceiling. A factory painted aluminum or vinyl louvered grille shall be fastened to the ceiling to cover the duct opening in the ceiling. The louver shall closely match the interior ceiling colors. The ductwork shall be 24 gauge galvanized steel, minimum. Appropriate flashing and lap cement shall be installed to ensure that the vents are fully weatherproof.

10210.3 CONSTRUCTION REQUIREMENTS

Fans, louvers, dampers and ventilators shall be installed at the locations shown on the Drawings. Installations shall be in strict accordance with the manufacturer's installation instructions, NEC, OSHA, applicable local codes and requirements, the Drawings, and these Specifications. Wall openings shall be as shown on the Drawings.

Equipment installed in a concrete or masonry opening shall be mounted with expansion anchors through the frame or flange, or as otherwise detailed on the Drawings. Equipment installed in a wood framed opening shall be installed using lag screws or bolts, or as otherwise detailed on the Drawings. Where a caulked seal is required, ventilation equipment shall be provided with caulking stops. After installation, all joints between the equipment and the opening shall be caulked.

10210.4 METHOD OF MEASUREMENT

10210.4.1 NO MEASUREMENT

Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

10210.4.2 SEPARATE MEASUREMENT

Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured by counting the completed and accepted units.

10210.5 BASIS OF PAYMENT

Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Install (*Size*) (*Type*) Louvers	Each
Replace (*Size*) (*Type*) Louvers	Each
Install (*Size*) (*Type*) Fan	Each
Replace (*Size*) (*Type*) Fan	Each
Install (*Size*) (*Type*) Damper	Each
Replace (*Size*) (*Type*) Damper	Each
Install (*Size*) (*Type*) Roof Ventilator	Each
Replace (*Size*) (*Type*) Roof Ventilator	Each
Install (*Size*) (*Type*) Room Ventilator	Each
Replace (*Size*) (*Type*) Room Ventilator	Each

10400.1 DESCRIPTION

This section covers furnishing and installing safety and hand railings and their supporting fixtures, frames, and/or hardware in buildings or on other structures. Materials and locations of installation are to be as shown on the Drawings or required in these Specifications.

10400.1.1 RELATED WORK

Not used.

10400.1.2 SUBMITTALS

10400.1.2.1 DESCRIPTIVE INFORMATION - The Contractor shall provide descriptive information which shows detailed dimensions of rails and posts, material composition, details of fittings or anchors required for fastening, finishing, manufacturer's name, loading bearing capacity and manufacturer's installation instructions in accordance with the requirements of Section 01300.

10400.1.2.2 COMPLIANCE WITH STANDARDS - Evidence of these materials complying with applicable industrial safety standards shall be provided. In cases where a potential exists for the railing to serve public access, compliance with the Uniform Federal Accessibility Standards shall be required.

10400.1.3 DEFINITIONS

Not used.

10400.2 MATERIALS

10400.2.1 ALUMINUM RAILING

Shall be extruded aluminum pipe with posts and fittings specifically manufactured for installation as handrails. Aluminum pipe materials shall have a minimum outside diameter of 2.0-inches. Spans between posts or mounting brackets shall not exceed 6-feet. Mounting screws and fasteners shall be stainless steel. Aluminum components of the railings shall be anodized and the railing shall be given a Class I architectural finish.

10400.2.2 FIBERGLASS RAILING

Shall be composite fiberglass with continuous glass fibers along the axial span and may be round or square tubing manufactured specifically for handrails. The resin used for the composition shall be fire retardant polyester. The color of the railings shall be yellow unless indicated otherwise by the Engineer. Railing installed where exposure to sunlight is possible, shall be provided with an ultraviolet (UV) light protection coating. Maintenance and repair instructions shall be provided to the Engineer with the submittal information indicated above. Metal hardware and materials furnished for mounting fiberglass handrails shall be stainless steel.

10400.2.3 STEEL PIPE RAILING

Shall be welded carbon steel pipe with posts and support fittings specifically manufactured for installation as handrails. Railing materials shall have a minimum outside diameter of 1.90-inches and a minimum wall thickness of 0.145-inches. Spans between posts or mounting brackets shall not exceed 6-feet. Mounting screws and fasteners shall be stainless steel. Following installation, all railings, posts and fittings shall be given two coats of gloss enamel epoxy paint of the color and as approved by the Engineer.

10400.2.4 TOP RAILINGS

Shall be continuous in sections up to 12-feet in length. When joints in the railings become necessary, they will be assembled tight and free from any sharp edges or burrs or nicks. All posts shall be single unspliced pipe lengths. Welds shall be ground smooth and finished to provide an uninterrupted surface.

10400.3 CONSTRUCTION REQUIREMENTS

Railing components shall be furnished from the same manufacturer and shall be installed in careful accordance with the manufacturer's instructions. All screwed or bolted fasteners shall be drawn up tight so that the completed railing is rigid and free of movements at joints and attachments.

10400.4 METHOD OF MEASUREMENT

10400.4.1 NO MEASUREMENT

No separate measurement shall be made for furnishing and installing railings when they are components of a structure or building shown on the Bid Schedule.

10400.4.2 SEPARATE MEASUREMENT

When shown as an item on the Bid Schedule, measurement shall be made for each linear foot of each type and configuration of railing furnished and installed. Such measurement shall include the posts and the supporting frame when normally furnished as a unit.

10400.5 BASIS OF PAYMENT

Separate payment for railings will not be made when they are furnished and installed as components in a building or enclosure identified in the Bid Schedule.

The accepted quantity of railings measured separately will be paid for at the contract unit price shown in the Bid Schedule for:

PAY ITEM	UNIT
(*Name*) Railings (*Size*) (*Type*)	Lineal Foot

ALUMINUM HANDRAIL (NON-WELDED PIPE) SECTION 10410

10410.1 DESCRIPTION

The Contractor shall furnish and install aluminum handrails as shown on the Drawings and required by these Specifications. One manufacturer shall supply all aluminum railings used on the project.

10410.1.1 RELATED WORK

Not used.

10410.1.2 SUBMITTALS

10410.1.2.1 DESCRIPTIVE LITERATURE - Descriptive literature which identifies the manufacturer, load capacity, and materials of fabrication for all items furnished under this section shall be provided by the Contractor in accordance with Section 01300 of these Specifications.

10410.1.2.2 CERTIFICATION OF COMPLIANCE - Certification of compliance to the standards and Specifications contained herein shall be obtained from the manufacturer and provided by the Contractor at the time of delivery of these materials to the project site.

10410.1.3 DEFINITIONS

Not used.

10410.2 MATERIALS

10410.2.1 QUALITY CONTROL

This specification is not intended to be exclusive or limit competition, but rather to set forth the minimum standards for quality and performance. The Owner reserves the right to reject substitutions if in his opinion, the proposed substitutions will not achieve comparable equipment installation and performance standards.

10410.2.2 FEDERAL SAFETY STANDARDS

The handrail system shall comply with minimum Federal safety standards

10410.2.3 HANDRAIL SYSTEMS

10401.2.3.1 MANUFACTURE - Handrail systems shall be the ReynoRail Aluminum Railing System, Connectorail Aluminum Railing system, or approved equal. All fastenings and fasteners shall be as recommended or furnished by the manufacturer.

10410.2.3.2 COMPOSITION - All rails, posts, and fitting-assembly spacers shall be formed from 6063-T5 or T6 extruded aluminum pipe of 1.9-inch OD and 0.145-inch wall thickness. Kick plates shall be fabricated of aluminum alloy 6061-T6. All other aluminum parts shall be 6063 extruded aluminum or F514.0 aluminum castings. Unexposed parts shall be Type 300 series stainless steel. All components shall be completely fabricated and assembled without welding. Plug screws or blind rivets shall be Type 305 stainless steel.

10410.2.3.3 FINISH - Aluminum railing components shall be given a Class I architectural anodized finish on all exposed surfaces after cutting, 4 mils on castings, and 0.7 mils on pipe. Aluminum shall be pretreated before anodizing for cleaning and removing all markings. Anodizing finish shall be clear.

10410.2.3.4 TOE BOARDS - The handrail system shall include toe boards where indicated on the Drawings and on all open sides of walkways or platforms where a person can pass beneath the walkway or platform, where there is moving machinery or where there is equipment with which falling material could create a hazard.

Toe boards shall be 4-inches nominal in vertical height from top edge to level of the floor or walkway. They shall be securely fastened in place with not more than 1/4-inch clearance above floor level.

10410.2.4 GATE MATERIALS

Aluminum gate materials, quality, design and workmanship shall be similar to the aluminum railing, and shall be designed as part of the railing system. Hinges shall be installed so that each gate can swing 180 degrees from the closed position to the fully open position. Gates shall swing to the walkway side of the handrail only. Gate stops shall be installed on the stationary railing posts to prohibit gates from swinging the wrong direction. Latch assemblies shall be of a durable self-locking type. Construction and installation of each gate frame, hinges, gate stops and latch shall conform to OSHA minimum strength requirements. Gate closing springs shall be stainless steel.

10410.3 CONSTRUCTION REQUIREMENTS

The Contractor install handrails where shown on the Drawings in accordance with the manufacturer's recommendations.

10410.3.1 WORKMANSHIP AND PROTECTION OF FINISH

The Contractor shall be responsible for the workmanship, rigidity, and protection of the system finish. He shall use all precautions necessary to protect the finish from scratches, nicks, gouges, dents, etc. during assembly and installation.

10410.3.2 ASSEMBLY AND INSTALLATION

10410.3.2.1 HANDRAIL SYSTEMS – Procedure shall be as follows:

- All pipe cuts shall be square and accurate for minimum joint-gap. Cuts shall be clean and straight, free of burrs and nicks. All holes shall be drilled and countersunk the proper size, as required for a tight, flush fit of assembly screws and all other component parts.

- All fastenings and fasteners shall be as recommended or furnished by the manufacturer, except that pipe rails shall be fastened to fittings with series 300 stainless steel pop rivets or flush set screws.

- Rail shall be erected straight, level, plumb, and true to the positions as indicated on the Drawings. Any deviation from the true line or grade, which is visible to the eye, shall be corrected.

- Posts shall be installed as single un-spliced pipe lengths. Post spacing shall not exceed 6 feet on center. All other attachment brackets shall be spaced as specified on the manufacturer's installation Drawings.
- Top rails shall be continuous whenever possible. Single, un-spliced lengths shall be attached to a minimum of 3 posts in all cases. Lower rails shall be single, un-spliced lengths between posts.

- Where protection is applied for prevention of dissimilar materials electrolysis, care shall be taken that none of the protective material is visible when assembly is completed.

- Fasteners shall be appropriately installed and drawn up tight with a hand wrench or screw driver so that completed railing is rigid and completely free of play at all joints and attachments. All hook bolts shall be tightened to torque recommended by the manufacturer.

10410.3.2.2 ALUMINUM GATES - Aluminum gates shall be installed at openings in the handrails where shown on the Drawings. Each gate shall consist of a gate frame, hinges, gate stops, and a latch. Each gate, in the closed position, shall be in a vertical plane with the handrail.

10410.4 METHOD OF MEASUREMENT

10410.4.1 NO MEASUREMENT

Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

10410.4.2 SEPARATE MEASUREMENT

Where items to be furnished and installed under this section are listed separately in the Bid Schedule, quantities shall be established by using a tape measure or other accurate measuring device to determine the total number of lineal feet of handrail system installed and accepted. This measurement shall include all gates, components, and fittings.

10410.5 BASIS OF PAYMENT

Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Aluminum Handrail System	Lineal Foot

10420.1 DESCRIPTION

The Contractor shall furnish and install steel safety and hand railings and their supporting frames and/or hardware in buildings or other structures at locations shown on the Drawings and as required by these Specifications.

10420.1.1 RELATED WORK

Not used.

10420.1.2 SUBMITTALS

10420.1.2.1 DESCRIPTIVE INFORMATION - The Contractor shall provide descriptive information which shows detailed dimensions of rails and posts, material composition, details of fittings or anchors required for fastening, finishing, manufacturer's name, loading bearing capacity and manufacturer's installation instructions in accordance with the requirements of Section 01300.

10420.1.2.2 CERTIFICATION OF COMPLIANCE - Certification of compliance to the standards and Specifications contained herein shall be obtained from the manufacturer and provided by the Contractor at the time of delivery of these materials to the project site.

10420.1.2.3 EVIDENCE OF STANDARDS - Evidence of these materials complying with applicable industrial safety standards shall be provided. In cases where a potential exists for the railing to serve public access, compliance with the Uniform Federal Accessibility Standards shall be required.

110420.1.3 DEFINITIONS

Not used.

10420.2 MATERIALS

10420.2.1 QUALITY CONTROL

This specification is not intended to be exclusive or limit competition, but rather to set forth the minimum standards for quality and performance. The Owner reserves the right to reject substitutions if in his opinion, the proposed substitutions will not achieve comparable equipment installation and performance standards.

10420.2.2 FEDERAL SAFETY STANDARDS

The railings system shall comply with minimum Federal safety standards.

10420.2.3 HANDRAIL SYSTEMS

10420.2.3.1 MANUFACTURE - Steel pipe handrail systems shall be by R. B. Wagner, Inc., or approved equal. One manufacturer shall supply all railings of each specific type used on the project.

10420.2.3.2 COMPOSITION - The steel tubing handrail system shall be carbon steel, galvanized steel, or stainless steel, as required on the Drawings, and shall be round or square configuration as shown. Handrail components, including tubing, posts and support fittings, shall be specifically manufactured for handrail installation. Round tubing shall have a minimum outside diameter of 1.90-inches and the minimum wall thickness of handrail material shall be 0.145-inches. All posts shall be single unspliced lengths.

10420.2.3.3 TOE BOARDS - The handrail system shall include toe boards on all open sides of walkways or platforms where a person can pass beneath the walkway or platform, where there is moving machinery or where there is equipment with which falling material could create a hazard.

Toe boards shall be 4-inches nominal in vertical height from top edge to level of the floor or walkway. They shall be securely fastened in place with not more than 1/4-inch clearance above floor level.

10420.2.3.4 FINISH - Stainless steel and hot dipped galvanized handrail systems shall have no factory-applied coatings, and stainless steel railings shall have a satin finish.

10420.2.3.5 HARDWARE - Mounting anchors and all fasteners shall be stainless steel, unless otherwise approved by the Engineer.

10420.2.4 GATE MATERIALS

Handrail system gate materials, quality, design and workmanship shall be similar to the railing, and shall be designed as part of the railing system. Hinges shall be installed so that each gate can swing 180 degrees from the closed position to the fully open position. Gates shall swing to the walkway side of the handrail only. Gate stops shall be installed on the stationary railing posts to prohibit gates from swinging the wrong direction. Latch assemblies shall be of a durable self-locking type. Construction and installation of each gate frame, hinges, gate stops and latch shall conform to OSHA minimum strength requirements. Gate closing springs shall be stainless steel.

10420.3 CONSTRUCTION REQUIREMENTS

The Contractor shall install handrails, as shown on the Drawings, in strict accordance with the manufacturer's installation instructions.

10420.3.1 WORKMANSHIP AND PROTECTION OF SYSTEM

The Contractor shall use all precautions necessary to protect the handrail system from damage until final acceptance.

10420.3.2 ASSEMBLY AND INSTALLATION

10420.3.2.1 HANDRAIL SYSTEMS – Procedure shall be as follows:

- All pipe cuts shall be square, clean, straight, and accurate. Welds shall be ground smooth and finished to provide an uninterrupted surface without burrs or nicks.
- Spans between posts and/or mounting brackets shall not exceed 6-feet. Joints shall be made through the use of standard flush weld techniques with uniform locking weld connectors.
- All screwed or bolted fasteners shall be drawn up tight so that the completed railing is rigid and free of movement at all attachments.

10420.3.2.2 GATES - Handrail gates shall be installed at handrail openings where shown on the Drawings. Each gate shall consist of a gate frame, hinges, gate stops, and a latch. Each gate in the closed position shall be in a vertical plane with the handrail.

10420.3.2.3 FINISH - Following installation, all carbon steel railings, posts and fittings shall be given two coats of gloss enamel epoxy paint, in accordance with Section 09910 of these Specifications. The color shall be selected and approved- by the Engineer.

10420.4 METHOD OF MEASUREMENT

10420.4.1 NO MEASUREMENT

Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

10420.4.2 SEPARATE MEASUREMENT

Where items to be furnished and installed under this section are listed separately in the Bid Schedule, quantities shall be established by using a tape measure or other accurate measuring device to determine the total number of lineal feet of handrail system installed and accepted. This measurement shall include all gates, components, and fittings.

10420.5 BASIS OF PAYMENT

Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Steel Handrail System	Lineal Foot

10790.1 DESCRIPTION

The Contractor shall furnish and install the items described herein and as shown on the DRAWINGS.

10790.1.1 RELATED WORK

Section 04100 – Brick Masonry

10790.1.2 SUBMITTALS

The CONTRACTOR shall submit a final layout(s) for approval prior to fabrication.

10790.3 SIGNS

10790.3.1 The CONTRACTOR shall furnish and install "Do Not Drink Water" signs at the locations shown on the DRAWINGS. The signs shall be high quality acrylic engraved with square cut beveled edges. The sign background shall be yellow, with Black lettering type and dimensions as shown in the following detail:

10790.4 METHOD OF MEASUREMENT

10790.4.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

10790.5 BASIS OF PAYMENT

Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

11010.1 DESCRIPTION

This section is included for guidance in the selection and installation of mechanical equipment. The requirements contained herein apply to all items of mechanical equipment the same as if these provisions were contained in the individual part of the Specifications for the equipment.

11010.1.1 RELATED WORK

Not used.

11010.1.2 SUBMITTALS

11010.1.2.1 SHOP DRAWINGS – Shop drawings shall be submitted as follows:

- The Contractor shall submit Shop Drawings to the Engineer for approval on all mechanical equipment to be furnished under this Contract in accordance with Section 01300. The number of copies submitted shall be four, PLUS the number of copies the Contractor wishes to have returned.

- Prior to submitting the drawings, the Contractor shall review the information for completeness. Only complete information will be reviewed by the Engineer, and only after the Contractor has signified his approval of the information. Shop drawings will not be approved until cut-away or assembly drawings, with part and material specification lists, have been submitted.

- Shop drawings shall consist of a cover sheet which indicates intended use and data summary, outline drawings, cut-away drawings, parts lists, material specification lists, and all information required to substantiate that the proposed equipment meets the Specifications. In some special cases reproducible transparencies of Shop Drawings shall be furnished to the Engineer in addition to the above mentioned number of copies.

- Shop drawings for motors shall include published dimension sheets and shall include a motor data sheet which shows all the motor characteristics, i.e., horsepower, voltage, code letter, design letter, service factor, enclosure, insulation, etc. All characteristics of the motor shall be shown on the data sheet, which shall be approved by the Engineer prior to delivery of the motor.

- Shop drawings for pumps shall include make, style, speed, size, type, head-capacity, efficiency, materials used, design features, weights, etc. All characteristics of the pump shall be shown on the data sheet, which shall be approved by the Engineer prior to delivery.

- The Contractor shall assume the responsibility to ensure that approved guards for all drive units, pulleys, or rotating shafting are detailed on Shop Drawings and submitted with them to the Engineer for approval.

11010.1.2.2 PARTS CALCULATIONS AND DETAILS - The Contractor shall provide calculations and details on all parts individually and collectively to show that the equipment offered satisfies the performance, strength, vibration, and other requirements of these Specifications.

11010.1.2.3 GEAR REDUCTION UNITS - The Contractor shall submit complete engineering information, catalog data, design features, load capacities, and mechanical efficiency ratings for each gear reduction unit incorporated in the work. This information shall also be included in the equipment Operation and Maintenance Manuals, as described herein.

11010.1.2.4 OPERATION AND MAINTENANCE MANUALS - The Contractor shall furnish to the Owner four (4) copies of Operation and Maintenance (O & M) Manuals for each system or item in accordance with Section 01300 of these Specifications and as follows:

- O & M manuals shall be broken down into sections. The sections shall include Mechanical Equipment, Automatic and Special Valves, Control Systems, Electrical, and other additional sections as necessary. All sections shall be labeled and each item shall be sub-labeled. Each section shall include a description of the operation and maintenance of each item or component included in that section.
- There shall be included in the front of each manual an index laminated with plastic on both sides for protection against rough use.
- Each manual shall be bound in hard cover
- The manuals shall be delivered to the Owner prior to installation of any operating equipment.
- No acceptance of any equipment will be made until the complete manuals have been submitted, evaluated and approved.
- One copy of the complete manual shall be at the jobsite available for use by the Contractor's field personnel, the Owner, and the Engineer during installation, start-up and testing of the equipment.

11010.1.3 DEFINITIONS

Not used.

11010.2 EQUIPMENT

11010.2.1 QUALITY CONTROL

All equipment shall be the product of a manufacturer experienced in the design, construction, and operation of equipment for the purpose required. The manufacturer shall have furnished such equipment long enough to be able to show a record of successful operation for a period of not less than two years. When two or more units of equipment for the same purpose are required, they shall be products of the same manufacturer.

11010.2.2 MANUFACTURER'S GUARANTEE

Manufacturers or suppliers of all equipment furnished under this contract shall guarantee said equipment for a period of 1 full year from the date of Substantial Completion or Final Acceptance of the work in accordance with Section 00700.29 of these Specifications. Equipment shall be made up of parts which are designed to act as a unit; and the manufacturer shall guarantee that when the component parts are assembled into the final unit, these parts will fit and operate satisfactorily.

11010.2.3 ACCOMMODATION TO SEA LEVEL

The elevation of this project above sea level is shown on Drawings. Design and performance of all mechanical equipment shall conform thereto.

11010.2.4 GENERAL REQUIREMENTS

11010.2.4.1 HEAVY DUTY RATING - The manufacturer shall rate all mechanical items heavy duty. All parts of equipment shall be amply proportioned for all stresses, which may occur during operation and for any additional stresses, which may occur during fabrication and erection. Unless specified otherwise, all bearings shall be sized as a minimum for 100,000-hour service at maximum loading under AFMBA B-10 conditions.

11010.2.4.2 STEEL AND IRON - Structural steel shall conform to ASTM A 36. Iron castings shall be tough close-grained gray iron castings in accordance with ASTM A 48.

11010.2.4.3 FASTENERS - All fasteners for aluminum shall be stainless steel. All steel other than stainless steel shall be isolated from aluminum with stainless steel, neoprene, or other approved material.

11010.2.4.4 MODIFICATIONS TO PRODUCTION LINE EQUIPMENT - Modifications shall be made in manufacturer's equipment to make it conform to the specific requirements of the Drawings and Specifications, if the standard product does not fulfill all requirements.

11010.2.4.5 PRODUCTION LINE IMPROVEMENTS - All equipment shall include all production line improvements made prior to the contract or delivery date.

11010.2.5 MOTORS

11010.2.5.1 GENERAL - The purpose of this subsection is to identify and define premium quality electric motors having high electrical and mechanical integrity and energy efficient operation under adverse operating conditions to give maximum life and minimum life cycle costs.

11010.2.5.2 COMPLIANCE – Standards for motors are as follows:

- Motors shall be totally enclosed, either fan-cooled or non-ventilated, squirrel-cage induction motors, NEMA frame size 182T through 449T, as indicated on the Drawings or prescribed in the Special Provisions. Motors shall be Reliance XE or approved equal.
- All motors covered by this specification shall conform to the latest applicable requirements of NEMA, IEEE, ANSI, and NEC standards, including IEEE Std. 841.
- Motors shall be designed for continuous duty for 3-phase, 60 HZ, 200, 230, 230/460 or 575 volt operation, NEMA design B.
- Ratings shall be based on a 40°C ambient temperature and on operation at the given project altitude. Ratings shall provide for a maximum resistance temperature rise of 80°C at a service factor of 1.0, and a 90°C rise at a service factor of 1.15, through 150HP.
- Motors shall be furnished with Class F insulation, 1.15 service factor but shall be selected for operation within their full load rating without applying the service factor.
- Motors shall be of a premium efficient design and shall be different from the manufacturer's standard efficient product.
- Motors shall be evaluated on conformance to this specification and total costs including initial cost and operating life-cycle cost. Life-cycle cost to be based on motor efficiency evaluation at a stated dollar penalty per kilowatt of motor losses based on specific operating conditions.

11010.2.5.3 CONSTRUCTION - Motor rotor construction shall be die cast aluminum or fabricated copper or their respective alloys. Rotors on frames 213T and above shall be keyed to shaft and rotating

assembly dynamically balanced to and .0005 inches peak to peak 182T-326T frames, and .00075 inches peak to peak 364T-449T frames. Balance weights, if required, shall be secured to the rotor resistance ring or fan blades by rivets. Machine screws and nuts are prohibited. The entire rotating assembly between bearing inner caps shall be coated with a corrosion-resistant epoxy.

11010.2.5.4 MECHANICAL – Mechanical requirements shall be as follows:

- Bearings shall be ball, open, single row deep groove, Conrad type, and shall have a Class 3 internal fit conforming to AFBMA Std. 20. For belted duty applications, drive end bearing may be cylindrical roller type.
- Bearings shall be selected to provide L10 rating life of 17,500 hours minimum for belted applications, 100,000 hours minimum for flexible direct coupled applications. Calculations shall be based on external loads using NEMA belted applications limits per MG1-14.07 and typical sheave weights and internal loads defined by the manufacturer including magnetic pull and rotating assembly weight.
- Bearing temperature rise at rated load shall not exceed 60°C 3600 RPM or 50°C 1800 RPM and slower. Temperature rise is to be measured by RTD or thermocouple at bearing outer race.
- Bearing AFBMA identification number shall be stamped on motor nameplate.
- Motor lubrication system shall consist of a grease inlet on motor bracket with capped grease fitting on inlet, grease relief plug 180 degree from inlet, grease reservoir in bracket and grease reservoir in cast inner cap.
- Motor to be greased by manufacturer with a premium moisture resistant polyurea thickened grease containing rust inhibitors and suitable for operation over temperature from -25°C to 120°C.
- Bearings shall be protected by INPRO/SEAL bearing isolators on both ends of the motor unless otherwise approved by the Engineer.

11010.2.5.5 ENCLOSURE – Motor enclosure including frame with integrally cast feet, end brackets, locking bearing inner caps, fan guards, and conduit box and cover shall be cast iron, ASTM Type A-48, Class 25 or better.

11010.2.5.6 CONDUIT BOX - Motor conduit box shall be cast iron construction; rotatable in 90-degree increments, diagonally split with tapped NPT threaded conduit entrance hole. Neoprene conduit box cover gasket and neoprene lead seal gasket between box and motor frame shall be furnished. The conduit box shall incorporate a mounted, clamp-type ground lug.

11010.2.5.7 COOLING FAN – The external cooling fan shall be corrosion-resistant, non-sparking, bi-directional, keyed, clamped and shouldered on the motor shaft.

11010.2.5.8 BREATHER DRAINS - Stainless steel automatic breather drains shall be provided in the lowest part of both front and back end brackets to allow drainage of condensation.

11010.2.5.9 MOUNTING HARDWARE - All mounting hardware shall be hex head, high strength, SAE Grade 5, plated for corrosion protection. Screwdriver slot fasteners are prohibited. A forged, steel, shouldered eyebolt shall be provided on all frames. Eyebolt receptacle shall be threaded and designed to prevent moisture or foreign material from entering motor when eyebolt is removed.

11010.2.5.10 NAMEPLATE - Corrosion resistant stainless steel nameplate shall be affixed to motor frame with stainless steel or brass drive pins. Nameplate(s) shall include all required NEMA data and AFBMA bearing numbers, and connection diagram for dual voltage motors.

11010.2.5.11 SHAFT SLINGER - An external V-ring shaft slinger shall be provided on both shaft extensions 254T and larger and on the drive end shaft only 182T-215T to minimize entrance of moisture or foreign material into bearing cavity.

11010.2.5.12 CORROSION PROTECTION - Frame to end bracket assembly of machined parts shall be protected and sealed by application of thick corrosion-resistant material to the machine surfaces prior to assembly.

11010.2.5.13 ELECTRICAL – Electrical requirements shall be as follows:

- All motors shall successfully operate under power supply variations per NEMA MG1-14.30.
- All motors shall be NEMA Design B with torque and starting currents in accordance with NEMA MG1-12.35 and 12.38 except in special applications requiring higher starting torques where NEMA Design C is permitted.
- Motors shall have copper windings.
- Motor insulation system shall be Class F minimum, utilizing materials and insulation systems evaluated in accordance with IEEE 117 classification tests.
- Motor leads shall be nonwicking type, Class F temperature rating or better and permanently numbered for identification.
- The entire wound and insulated stator shall receive an additional coating of epoxy paint on all air gap surfaces, to protect against moisture and corrosion.

11010.2.5.14 FACTORY TESTING - Each completed and assembled motor shall receive a routine factory test per NEMA standards.

11010.2.5.15 NOISE - The no-load sound pressure level, based on the A-weighted scale at 3 feet when measured in accordance with IEEE Std. 85 should not exceed 85 DBA.

11010.2.5.16 EFFICIENCY - All motors shall be of an energy-efficient design, different from manufacturer's standard product through the use of premium materials, design and improved manufacturing process, that reduces motor losses approximately 40% from standard efficient designs, and whose minimum efficiencies exceed NEMA Table MG1-12.6C. Motor efficiency shall be determined in accordance with NEMA Standard MG1-12.54 and full load efficiency labeled on motor nameplate in accordance with NEMA Standard MG1-12.55.

11010.2.5.17 FINISH - All motor parts including frame, brackets, fan cover, and terminal box shall receive a minimum of two coats of high grade USDA accepted epoxy paint. Motor assembly must satisfactorily withstand salt spray tests for corrosion per ASTM B-117 for 96 hours.

11010.2.6 PUMPS

11010.2.6.1 GENERAL - The Contractor shall furnish, install, and test all pumps. Pumps shall be of heavy-duty construction for heavy-duty continuous service or for intermittent service, whichever imposes the most severe service on the pump. Pumps of inferior design or make will not be accepted.

11010.2.6.2 MECHANICAL DEFECTS - Mechanical defects shall include excessive vibration, improper balancing of any rotating parts, improper tolerances, binding, excessive motor heating, defective materials, improper fitting of parts, and any other defect which will in time damage the pump or pumps or unreasonably impair the efficiency of the pumps.

11010.2.6.3 CAUSE FOR REJECTION – Rejection of pumps for cause will be as follows:

- Pumps that have mechanical defects or do not meet the range of head-capacity characteristics, efficiency, and vibration requirements will be rejected and shall be replaced at the Contractor's full expense for furnishing, installing, removal, and replacement.

- If it is found upon delivery that the pump materials do not agree with the requirements of the Specifications as to size, type, quality, or metallurgy, they will be rejected as unfit for use on this project. Bronze or brass parts of any pump in contact with the pumped liquid shall contain no aluminum nor greater than six percent zinc.

11010.2.6.4 FRICTION LOSSES - Pump friction losses, including entrance, column, shaft, and discharge losses shall be added to the total dynamic heads that are specified under each pump in order to get the head that the impeller must pump against. Pump head-capacity curves shall indicate that these losses have been included.

11010.2.6.5 PRESSURE GAUGES - Pumps shall be tapped at the suction and discharge for pressure gauges. In general, all pumps that can be tested by pressure gauges shall be provided with suitable taps on both suction and discharge. Taps may be in pumps or in adjacent pipes within three inches of the pump flange.

11010.2.6.6 TESTING - Each and every pump, with its motor, drive, gearing, etc., shall be checked run, and tested at the place of manufacture. In addition, all pumps shall be volumetrically tested as to head-capacity requirements and for the purpose of cross checking the calibration of meters as required by the Engineer, after installation. Four certified laboratory performance curves for each pump shall be submitted to the Engineer for approval before shipment of the pump.

11010.2.7 MECHANICAL POWER TRANSMISSION EQUIPMENT

All mechanical power transmission equipment including V-belts, sheaves, chains, sprockets, mechanical variable speed drives, gear reducers, open and enclosed gearing, clutches, brakes shall be rated for 24-hour a day service and sized with a minimum service factor of 1.5. The 1.5 service factor shall be related to the nameplated HP and torque of the prime source of power and not the equipment actual loading. Should the manufacturer recommend a service factor larger than 50%, the manufacturer's recommendation shall take precedence.

11010.2.8 GEAR REDUCTION UNITS

11010.2.8.1 CONSTRUCTION - Unless otherwise specified, all gear reduction units shall be helical or herringbone type. No planetary gear units shall be used for any purpose, and worm gear type units may be used only where specified. Gears of gear reduction units shall be made of highest quality alloys treated for hardness and severe service. The complete reduction unit shall be fully enclosed

in a heavy cast iron housing with gears running in oil. All bearings shall be of the anti-friction type.

11010.2.8.2 CLASS OF SERVICE - Gear reduction units shall be selected for the class of service specified. The class of service must be determined by the manufacturer of the gear reduction units after being informed by the Contractor as to what equipment the units are to be used for and to what type of duty the equipment will be subjected. Where no class of service is specified, gear reduction unit class of service shall be Class II or heavier, as required, as classified by the American Gear Manufacturers Association.

11010.2.8.3 CAPACITY AND PERFORMANCE - The actual and rated horsepower capacity, torque, overhung capacity, and bearing capacity of each reduction unit shall be not less than the horsepower rating of the drive motor nor less than that which will be encountered under full load and under the most severe operating conditions which the equipment will be called upon to operate. The Engineer may reject any gear reduction unit that does not meet the above requirements. Only gear reduction units of long established manufacture and reputation may be used.

11010.2.9 SPECIAL TOOLS

All special tools that are required to assemble, disassemble, repair, and maintain any item of mechanical equipment shall be furnished with the equipment. Special tools shall include any type of tool that has been specifically made for use on an item of equipment for assembly, disassembly, repair, and maintenance. When special tools are provided, they shall be marked or tagged, and a list of such tools shall be included with the maintenance and operation instructions describing the use of each marked tool.

11010.2.10 LUBRICATION FITTINGS

All lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housing, or guards. Fittings shall be accessible from safe, permanent walk or walk areas without ladders, scaffolds, etc. Fittings shall be Lincoln “Bullneck” Hydraulic Surface Check Fittings (Lincoln Engineering Co., St. Louis, Missouri), or approved equivalent. Lubrication fittings shall be mounted together wherever possible. They shall not be individual fittings field mounted together, but use shall be made of factory-mounted multiple fitting assemblies located in convenient area. Connection from multiple fitting assemblies to point of use shall be minimum 3/16” stainless steel tubing, securely mounted parallel with equipment lines and protected where exposed to damage.

11010.2.11 MACHINERY AND EQUIPMENT GUARDS

11010.2.11.1 CONSTRUCTION AND INSTALLATION - All machinery drive units, pulleys, or rotating shafting shall be furnished with approved guards, shields, or barriers. Such guards, shields, or barriers shall be neatly and substantially constructed, adequately supported from adjacent framing,. Guards shall be constructed of 6061-T6 aluminum unless otherwise indicated. The frame shall be covered with expanded aluminum for heat dissipation. All guards shall be isolated so no dissimilar metals come into contact.

All guards shall be sized to allow installation of pulleys up to and including 15 percent over size. The width of the guard shall be such as to allow one additional belt to be added in the future.

11010.2.11.2 COMPLIANCE - Guards shall be provided in all cases where required by state or OSHA or local codes. While all such guards may not be shown in detail on the Drawings, the Contractor is

expected to be familiar with the requirements of local, state, and federal regulations regarding machinery guards and safety devices.

11010.2.12 PAINTING

All equipment furnished for the project shall be painted in accordance with the requirements of Division 9 of these Specifications.

11010.3 EQUIPMENT CONSTRUCTION, INSTALLATION, AND TESTING

11010.3.1 GENERAL

The furnishing and installation of equipment shall include testing, painting, checking levels and alignment, furnishing and placing of lubricants of whatever type, and furnishing of factory-trained service mechanics or engineers where called for. All equipment when finally installed shall be complete and ready for operation without binding or overloading of critical components or motors. The Contractor shall furnish at no extra cost to the Owner all appurtenances, piping, valves, fittings, wiring, supports, hangers, etc., as are required to place the equipment in first-class operating condition and in a near and workmanlike manner.

11010.3.2 INSTALLATION

11010.3.2.1 GENERAL - Equipment shall be installed complete and ready to operate by skilled craftsmen. Each craftsman employed to install a specific type of equipment shall be thoroughly trained in the particular trade required to install that equipment.

All moving parts of equipment and machinery shall be carefully installed, tested for operation, and adjusted so that all parts move freely and function to secure satisfactory operation.

11010.3.2.2 WELDING - Qualified welders in accordance with applicable welding codes and procedures shall perform all welding. Welding shall be by electric arc, unless otherwise shown on the Drawings or required by these Specifications.

11010.3.2.3 ANCHOR BOLTS - Anchor bolts for heavy equipment shall be encased in metal tubing having an inside diameter not less than two times that of the bolt, unless otherwise detailed on the Drawings. Foundations for pumps, motors and other equipment shall be left one inch below the grade of machine base unless otherwise required on the Drawings. After the proper setting of machine for alignment and grade, the recess below the equipment base, together with recess between the anchor bolt and the metal tube, shall be grouted and carefully finished with non shrink grout.

11010.3.2.4 PIPING - All piping required for proper operation of equipment shall be installed. Piping layouts may require modification from that shown on the Drawings depending on equipment furnished. All costs for piping or piping modifications required to suit the particular equipment furnished shall be borne by the Contractor.

11010.3.2.5 ELECTRICAL - Unless otherwise specified herein all electrical work, materials and equipment shall conform to the provisions of Division 16, Electrical of these Specifications. It shall be the responsibility of the Contractor to provide complete electrical systems sized to suit the equipment furnished and installed.

11010.3.2.6 ALIGNMENT OF MOTORS AND EQUIPMENT – Alignment of motors and equipment shall be as follows:

- In general, checking and correcting the alignment shall follow the procedures established in Section B (1X) of the Standards of the Hydraulic Institute, Instructions for Installation, Operation, and Maintenance of Centrifugal Pumps, as applicable.

- In all cases, the equipment shall be properly leveled and brought into angular and parallel alignment.

- Equipment bases shall not be grouted nor foundation bolts finally tightened until all piping connections are complete and in satisfactory alignment, such that no strain is transmitted to the equipment.

- In every case where a drive unit is connected to a driven piece of equipment by a flexible coupling, the coupling halves shall be disconnected and the alignment between the motor and the equipment checked and corrected after the complete unit has been leveled on its foundation. The alignment shall then be checked and corrected again after the grout has cured and the foundation bolts have been tightened.

11010.3.2.7 GROUTING – Grouting shall be performed as follows:

- Machinery shall first be perfectly aligned and leveled by means of steel wedges and shims near the anchor bolts. Anchor bolts shall be tightened against the shims on wedges before placing grout.

- Before grout placement, equipment foundations shall be prepared by chipping, hammering or sand blasting the entire concrete surface which will be grouted to remove any dirt or grease and to expose the concrete aggregate, unless approved otherwise by the Engineer.

- The equipment shall again be checked for level and alignment.

- The roughened foundation shall then be thoroughly cleaned, and the grout shall be thoroughly packed into place, filling all voids under the base of equipment.

- Special non-shrink grout shall be used in the placement of all heavy equipment and equipment bases. Non-shrink grout shall be as specified in Division 3 of these Specifications.

- Grout around all machinery bases shall be neatly pointed. All sandblast residue, grease, and debris shall be removed before any grout placement is started.

11010.3.3 TESTING

11010.3.3.1 GENERAL - Before testing, all equipment and mechanisms shall be filled by the Contractor with the proper amounts and types of oil and grease as recommended by the equipment manufacturer. The Contractor shall furnish all personnel, chemicals, and other necessary items as are required for the initial testing of equipment.

11010.3.3.2 DURATION OF TEST - Generally each piece of equipment, which in its normal use will operate for prolonged periods, shall be operated by the Contractor for at least 24 hours after installation, unless the Engineer is satisfied that a shorter test period is adequate. Satisfactory completion of this test does not relieve the Contractor of his responsibility in the event of binding, overloading, over-heating, or other equipment failure or malfunction after initial testing is performed.

11010.3.3.3 VIBRATION - The prime supplier shall make field tests for acceptable vibration in the on all pumps or other equipment with rotating shafts and/or a drive unit. Units shall be field tested for vibration after installation using the following process:

- All vibration testing shall be performed in the presence of and be witnessed by the Engineer. Testing shall be as required by the Engineer at various speeds between maximum and minimum. The Engineer shall be furnished a complete copy of vibration test data for each test performed.
- Each unit shall be tested separately with no other unit running.
- Drive systems, complete with motors, in place at the jobsite shall not vibrate more than 0.012 amplitude inch. Amplitude as used in this Section shall mean total peak-to-peak displacement, and it shall be measured by an IRD Vibration Meter, Model 306, or approved equal.
- All field tests shall be running tests with the drive unit driving the equipment.
- The equipment shall be free of static unbalance; shall be free of dynamic unbalance up to the maximum speed of the drive system; shall have the torsional critical speed 20 percent above the maximum speed of the pump and drive system.
- Vibration that occurs at the rotational critical speed shall not be greater than 0.012 amplitude inch; and shall be free of apparent unbalance caused by defective bearings, by close-fitting parts which may rub on the rotating parts intermittently, by loose discs or rotor parts, unbalanced loads, or by oil whip.
- Unless directed otherwise by the Engineer, vibration shall be measured at the top of the motor.

11010.3.3.4 NOISE LEVELS – Noise levels for the equipment and motors shall be measured in the field in accordance with AGMA 295.03. The combination equipment and motor, shall be designed to emit not more than 85 dBA when the measurements of the “C” network of the sound level meter are converted to “A” network readings or read directly on “A” network, unless otherwise specified. The manufacturer shall guarantee the sound levels specified. Enclosures built over the units are not acceptable as a means to meet specified sound levels. Each piece of equipment and its driver shall be tested through the range of possible operating speeds.

11010.4 METHOD OF MEASUREMENT

Not used.

11010.5 BASIS OF PAYMENT

Not used.

11100.1 DESCRIPTION

All individual mechanical equipment items specified in this part of the specifications shall comply with requirements outlined in Section 15010 – Basic Mechanical Requirements.

SPECIAL PROVISION

STARTUP AND COMMISSIONING — SECTION 11280SP

11280 GENERAL

The Contractor shall ultimately be responsible for providing a complete and functioning treatment and distribution system as described in the project drawings and specifications. In order to ensure that the interdependent systems and equipment operate successfully as a single treatment and distribution system, the following requirements are provided.

11280.1 Related Work and Referenced Sections

Section 01000SP Owner Furnished Equipment

11280.2 EXECUTION

11280.2.1 Startup and Field Services

The requirements for startup and training for the individual systems are set forth in the individual equipment specifications. It is highly recommended that the contractor coordinate the startup services for all of the interdependent equipment to occur at the same time to ensure that the respective authorized field representatives for each piece of equipment are present to perform calibration or adjustments as required to facilitate the operation of the system as a whole. The following systems are identified as interdependent equipment:

- Screen, Screening Conditioning Equipment, and Controls
- Grit Removal, Grit Trap, Washer, and Controls
- Chemical Dosing
- BNR Process and Equipment
- Aerobic Digester
- Blowers
- Clarifier
- Sludge Dewatering System
- Disc filters
- Ultraviolet Disinfection System
- Non-Potable Water Pumps
- Treatment Plant SCADA

This list should not be considered all inclusive, as there may be additional items that need to be included in the startup coordination. It shall be the responsibility of the Contractor to coordinate the presence of the required service technicians in order to provide a fully functioning system.
Any additional trips or days onsite required to provide a fully functioning treatment and distribution system will be provided at the Contractor's expense, except when necessity for the increased time is caused by the owner, or otherwise specified by the owner.

Substantial completion of the project shall not be granted until the complete treatment and distribution system, including all of the individual systems, has operated as designed for a minimum of 72 hours.

11280.2.2 Follow Up Site Visit

The Contractor shall coordinate a follow up site visit with the manufacturers' authorized field service technicians for all of the interdependent systems approximately 6 weeks following initial startup and commissioning. The follow up site visit shall be scheduled at least two weeks in advance in order to provide Mountain Green Sewer District time to prepare for the visit. The follow up site visit shall include a minimum of two (2) man days. All of the field service technicians shall be onsite

during the same two days. The purpose of the follow up site visit is for Mountain Green Sewer District Operators to relay concerns, suggestions, and questions regarding the operation and maintenance of the equipment and the system as a whole. Field service technicians shall be prepared to make adjustments to the equipment and controls in order to accommodate any functional or operational changes requested by Mountain Green Sewer District Operators, within the standard capacity and functionality of the equipment. Field service technicians shall also be prepared to provide any requested follow on training as time permits.

Any additional trips or time onsite required to provide the required adjustments to the treatment and distribution system that are caused by the absence of an authorized field service technician will be provided at the Contractor's expense.

11280.3 METHOD OF MEASUREMENT

No separate measurement shall be made for Startup and Commissioning.

11280.4 BASIS OF PAYMENT

No separate payment shall be made for Startup and Commissioning.

SPECIAL PROVISION

SLUDGE TRAILER	SECTION 11825SP

11825.1 DESCRIPTION

The Contractor shall furnish a Sludge Trailer as specified herein and as manufactured by Big Tex Trailer Manufacturing, Inc. or approved equal.

11825.2 MATERIALS

11825.2.1 Sludge trailer shall be a 25DU-18 Tandem Dual Gooseneck Dump type with the following as standard features:

- complete break-a-way system with charge line
- heavy duty 10 gauge floor
- 48" sides with formed channel supports
- spare mount
- self-contained electric hydraulic scissor lift
- lockable control unit
- 45 degree dump angle
- double rear gates with cam latch
- removable header across rear
- double ½" tie rods on all 4 sides
- fully enclosed pump & battery box between gooseneck uprights

11825.2.2 Sludge trailer shall be dual axel, with a minimum 21.98 cu.yds. capacity and 18,200 pound payload capacity. Trailer shall have a minimum length of 18', a maximum height of 7' 6".

11825.3 METHOD OF MEASUREMENT

11825.3.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

11825.4 BASIS OF PAYMENT

11825.4.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

SPECIAL PROVISION

WASTE CONTAINER	SECTION 11875SP

11875.1 DESCRIPTION

The Contractor shall furnish two waste containers as specified herein. A product of equal quality, dimension, and effectiveness may be used upon approval.

11875.2 MATERIALS

11875.2.1 The waste containers shall be of the Rolloff dumpster or trailer dumpster at owner's choice. The specific dumpster shall be approved by the engineer. Waste containers shall be from city to the following specifications.

- Top Size (L x W x H) 48 x 44 x 39.5
- Bottom Size (L x W x H) 37 x 33 x 39.5

The waste containers shall have a 32.5 cubic foot capacity, shall come with lid, and shall meet OSHA requirements.

11875.3 METHOD OF MEASUREMENT

11875.3.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

11875.4 BASIS OF PAYMENT

11875.4.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

SUPER T SERIES 10”
HORIZONTAL SELF-PRIMING CENTRIFUGAL PUMP
TYPICAL PERFORMANCE SPECIFICATIONS

PART 1 - GENERAL

1.01 PERFORMANCE CRITERIA

A. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

B. The pump manufacturer must be registered to the ISO 14001 Environmental Management System standard and as such is committed to minimizing the impact of its activities on the environment and promoting environmental sustainability by the use of best management practices, technological advances, promoting environmental awareness and continual improvement.

C. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 10” suction connection, and 10” discharge connection. Each pump shall be selected to perform under following operating conditions:

1. Capacity (GPM)	1562
2. Total Dynamic Head (FT)	14.31
3. Total Dynamic Suction Lift (FT)	8.34
4. Maximum Repriming Lift (FT)	3.75
5. Maximum Static Suction Lift (FT)	3.75
6. Total Discharge Static Head (FT)	0.52

D. Pump Performance Certifications

1. Solids Handling Capability

a. All internal passages, impeller vanes, and recirculation ports shall pass a 3” spherical solid. Smaller internal passages that create a maintenance nuisance or interfere with priming and pump performance shall not be permitted. Upon request from the engineer, manufacturer’s certified drawings showing size and location of the recirculation port(s) shall be submitted for approval.

E. Reprime Performance

1. Consideration shall be given to the sanitary sewage service anticipated, in which debris is expected to lodge between the suction check valve and its seat, resulting in the loss of the pump suction leg, and siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal, and the pump must be capable of automatic, unattended operation with an air release line installed.

2. During unattended operation, the pump shall retain adequate liquid in the casing to insure automatic repriming while operating at its rated speed in a completely open system. The need for a suction check valve or external priming device shall not be required.

3. Pump must reprime 3.75 vertical ft. at the specified speed and impeller diameter. Reprime lift is defined as the static height of the pump suction above the liquid, while operating with only one-half of the liquid remaining in the pump casing. The pump must reprime and deliver full capacity within five minutes after the pump is energized in the reprime condition. Reprime performance must be confirmed with the following test set-up:

   a. A check valve to be installed downstream from the pump discharge flange. The check valve size shall be equal (or greater than) the pump discharge diameter.

   b. A length of air release pipe shall be installed between pump and the discharge check valve. This line shall be open to atmosphere at all times duplicating the air displacement rate anticipated at a typical pump station fitted with an air release valve.

   c. The pump suction check valve shall be removed. No restrictions in the pump or suction piping will prevent the siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a 2 feet minimum horizontal run, a 90^{o} elbow and vertical run at the specified lift. Pipe size shall be equal to the pump suction diameter.

   d. Impeller clearances shall be set as recommended in the pump service manual.

   e. Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.

   f. Liquid to be used for reprime test shall be water.

   g. Upon request from the engineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

(Optional **Certified Pump Performance Test)*

F. Certified Pump Performance Test

1. Tests shall be conducted in accordance with Hydraulic Institute Standards 14.6.3.4 Acceptance Grade 2B at the specified head, capacity, rated speed and horsepower. The performance tests will validate the correct performance of the equipment at the design head, capacity and speed.

2. For pumps utilizing up to (13 HP) motors; but larger than (1.3 HP), tests shall be conducted in accordance with Hydraulic Institute Standards 14.6.3.4.1, as the specified head, capacity, rated speed and horsepower.

G. Manufacturer's Warranty

1. The pump manufacturer shall warrant the pump equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

2. All equipment, apparatus, and parts furnished shall be warranted for sixty (60) months, excepting only those items that are normally consumed in service, such as oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the pump equipment and all components.

3. Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

4. It is not intended that the pump manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

1. This limited warranty shall be valid only when installation is made and use and maintenance is performed in accordance with manufacturer recommendations. The warranty shall become effective on the date of acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment from the factory, whichever occurs first.

PART 2 - PRODUCT

2.01 MANUFACTURER

A. The specifications and project drawings depict equipment and materials manufactured by The Gorman-Rupp Company which are deemed most suitable for the service anticipated. It is not intended, however, to eliminate other products of equal quality and performance. The contractor shall prepare his bid based on the specified equipment for purposes of determining low bid. Award of a contract shall constitute an obligation to furnish the specified equipment and materials.

B. In order to unify responsibility for proper operation, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source) and that source shall be the pump manufacturer. The pumps must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer’s representative or distributor be accepted.

C. Manufacturer must show proof of original product design and testing. Products violating intellectual property regulations shall not be allowed, as they may violate international law and expose the user or engineer to unintended liabilities. “Reverse-engineered” products fabricated to substantially duplicate the design of original product shall not be allowed, as

they may contain substantial differences in tolerances and material applications addressed in the original design, which may contribute to product failure.

H. The term “pump manufacturer” shall be defined as the entity which designs, machines, assembles, hydraulically tests and warranties the final product. Any entity that does not meet this definition will not be considered a “pump manufacturer and is not an acceptable supplier. For quality control reasons and future pump and parts availability, all major castings of the pump shall be sourced and machined in North America.

D. After execution of the contract, the contractor may offer substitutions to the specified equipment for consideration. The equipment proposed for substitution must be superior in construction and performance to that specified in the contract, and the higher quality must be demonstrated by a list of current users of the proposed equipment in similar installations.

E. In event the contractor obtains engineer's approval for equipment substitution, the contractor shall, at his own expense, make all resulting changes to the enclosures, buildings, piping or electrical systems as required to accommodate the proposed equipment. Revised detail drawings illustrating the substituted equipment shall be submitted to the engineer prior to acceptance.

F. It will be assumed that if the cost to the contractor is less for the proposed substitution, then the contract price shall be reduced by an amount equal to the savings.

2.02 PUMP DESIGN

A. Pumps shall be horizontal, self-priming centrifugal type, designed specifically for handling raw, unscreened, domestic sanitary sewage. Pump solids handling capability and performance criteria shall be in accordance with requirements listed under PART 1 - GENERAL of this section.

B. The pump manufacturer must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.

C. Materials and Construction Features

1. Pump casing shall be cast iron Class 30 with integral volute scroll. Casing shall incorporate following features:

a. Mounting feet sized to prevent tipping or binding when pump is completely disassembled for maintenance.

b. Fill port cover plate, 3 1/2" diameter, shall be opened after loosening a hand nut/clamp bar assembly. In consideration for safety, a clamp bar screw must provide slow release of pressure, and the clamp bar shall be retained by detente lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.

c. Casing drain plug shall be at least 1 1/4" NPT to insure complete and rapid draining.

d. Liquid volume and recirculation port design shall be consistent with performance criteria listed under PART 1 - GENERAL of this section.

2. Suction Head shall be Class 30 cast iron. Its design must incorporate following maintenance features:

   a. The suction head will be secured to the pump casing by using hex head cap screws and lock washers. Access to the impeller and mechanical seal shall be accomplished by removing the suction head.

   b. Removal of any blockages in the impeller shall be accomplished by removing the suction head, or through a cleanout cover on the suction head. In consideration of safety, two clamp bar screws must provide slow release of pressure on two clamp bars securing the cleanout cover. A cork gasket shall provide a leak-free seal between the cleanout cover and suction head casing.

   c. Removal of the suction check valve shall be accomplished through the removable cleanout cover on the suction head.

   d. In consideration for safety, a pressure relief valve shall be supplied in the suction head. The relief valve shall open at 75-200 PSI.

   e. A replaceable ductile iron wear plate shall be secured up against the pump casing by the suction head. Measurement of the clearance between this wear plate and impeller shall be accomplished through the cleanout cover plate.

3. Rotating assembly, which includes impeller, shaft, mechanical shaft seal, lip seals, bearings, seal plate and bearing housing, must be removable as a single unit without disturbing the pump casing or piping. Design shall incorporate following features:

   a. Seal plate and bearing housing shall be cast iron Class 30. Separate oil filled cavities, vented to atmosphere, shall be provided for shaft seal and bearings. Cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil.

      1) The bearing cavity shall have an oil level sight gauge and fill plug check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug check valve. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.

      2) The seal cavity shall have an oil level sight gauge and fill/vent plug. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the fill/vent plug.

      3) Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

   b. Impeller shall be ductile iron, two-vane, semi-open, non-clog, with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lock screw and conical washer.

c. Impeller shaft shall be AISI 17-4 pH stainless steel.

d. Bearings shall be anti-friction ball type of proper size and design to withstand all radial and thrust loads expected during normal operation. Bearings shall be oil lubricated from a dedicated reservoir. Pump designs which use the same oil to lubricate the bearings and shaft seal shall not be acceptable.

e. Shaft seal shall be cartridge oil lubricated mechanical type. The stationary and rotating seal faces shall be tungsten titanium carbide alloy. Each mating surface shall be lapped to within three light bands flatness (35 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating by virtue of a dual O-ring design; an external O-ring secures the stationary seat to the seal plate, and an internal O-ring holds the faces in alignment during periods of mechanical or hydraulic shock (loads which cause shaft deflection, vibration, and axial/radial movement). Elastomers shall be viton; cage and spring to be stainless steel. Seal shall be oil lubricated from a dedicated reservoir. The same oil shall not lubricate both shaft seal and shaft bearings. Seal shall be warranted in accordance with requirements listed under PART 1 - GENERAL of this section.

f. Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same cap screws as used for retaining rotating assembly.

4. Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means.

   a. Clearances shall be maintained by using external shims between the casing ring of the rotation assembly and the pump casing itself. Shims will be of various sizes to allow precise adjustment of this clearance. The clearance can be measured by removing the cleanout cover on the suction head.

   b. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.

5. Suction check valve shall be molded Neoprene with integral steel and nylon reinforcement. A blow-out center shall protect pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cleanout cover on the suction head without disturbing the suction piping. Sole function of check valve shall be to save energy by eliminating need to reprime after each pumping cycle. Pumps requiring a suction check valve to assist reprime will not be acceptable.

6. Removal of the rotating assembly will be accomplished through the front or the back of the pump casing.

*(Optional Accessory for **CONTINUOUS VANE IMPELLER WITH SELF-CLEANING WEAR PLATE**)*

7. Continuous Vane Impeller with Self-Cleaning Wear plate

    a. The nature of the conveyed medium poses significant challenges to the continuous operation of the pump. Of particular concern is the clogging of the impeller by debris in the pumped medium including but not limited to long rags, fibers, and like debris which are able to wrap around the impeller vanes, stick to the center of the vanes or hub, or lodge within the spaces between the impeller and the housing.

    b. The pump impeller shall be a continuous vane extending from one edge of the impeller through the central portion of the impeller to the other edge. The impeller height shall increase continuously from the outer radius of to the central region of the impeller.

    c. The matching wear plate shall have one or more notches and/or recesses provided along a common diameter of the wear plate to disturb and dislodge any solids which might otherwise remain on the impeller in dynamic operation. Clusters of notches and/or recesses may also be provided.

(Optional Accessory for VOLUTE CASING HEATER)

8. Volute Casing Heater:

    a. Pump shall be provided with a thermostat mounted to the exterior of the volute casing, and a ___ watt 115 volt electric heater inserted into the interior of the volute by means of a dedicated port. The heater shall be energized at 43+/-3 degrees F to provide heat to the casing and eliminate the possibility of freezing. Heater probes that must be installed through a pump drain port shall not be acceptable. Heater probes that must be installed through a pump drain port shall not be acceptable.

D. Serviceability

1. The pump manufacturer shall demonstrate to the engineer's satisfaction that consideration has been given to reducing maintenance costs.

2. No special tools shall be required for replacement of any components within the pump.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Immediately after off-loading, contractor shall inspect complete pump and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all pump serial numbers and parts lists with shipping documentation.

Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

A. Install, level, align, and lubricate pump(s) as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to control panel.

D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

E. After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

3.03 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable, it is safe and in optimum working condition, and conforms to the specified operating characteristics.

2. After construction debris and foreign material has been removed form the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

4) Impeller clearances shall be set as recommended in the pump service manual.
5) Repeatability of performance shall be demonstrated by testing five consecutive reprime cycles. Full pump capacity (flow) shall be achieved within five minutes during each cycle.
6) Liquid to be used for reprime test shall be water.

Upon request from theEengineer, certified reprime performance test results, prepared by the manufacturer, and certified by a registered professional engineer, shall be submitted for approval prior to shipment.

11900.3.2.3 FACTORY SYSTEM TEST

All components including the pumps, motors, valves, and piping will be tested as a complete working system at the manufacturer's facility. Tests shall be conducted in accordance with Hydraulic Institute Standards at the specified head, capacity, rated speed and horsepower. Factory operational test shall duplicate actual performance anticipated for the complete station.

Upon request from the engineer, the operational test may be witnessed by the engineer, and/or representatives of his choice, at the manufacturer's facility.
The manufacturer’s technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment as described in Part 3 of this section.

11900.3.3MANUFACTURER'S WARRANTY

The pump Manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

All other equipment, apparatus, and parts furnished shall be warranted for five (5) years, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump Manufacturer shall be solely responsible for warranty of the station and all components.

Components failing to perform as specified by the Engineer, or as represented by the Manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the owner.

It is not intended that the pump Manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

The warranty shall become effective upon the acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment, whichever occurs first.

11900.3.4SERVICEABILITY

The pump manufacturer shall demonstrate to the Engineer's satisfaction that consideration has been given to reducing maintenance costs by incorporating the following features.

No special tools shall be required for replacement of any components within the pump.

11900.3.5Contractor must insure all pipes connected to the pump station are supported to prevent piping loads from being transmitted to pumps or station piping. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

11900.3.5EXECUTION

11900.3.5.1 EXAMINATION

Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacture shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

11900.3.5.2 INSTALLATION

The Contractor shall install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacture at time of delivery.

Suction pipe connections shall be vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

The air release valve vent piping shall be installed such that the end of the pipes are submerged in the wet well at all times.

The lift station shall be mounted on a neoprene and cork vibration isolation pad. The vibration isolation pad shall be rated to carry the entire weight of the station. The isolation pad shall be provided as part of the lift station.

The Contractor shall check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

11900.3.6FIELD QUALITY CONTROL

11900.3.6.1 OPERATIONAL TEST

Prior to acceptance by Owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the Specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.

After construction debris and foreign material has been removed form the wet well, the Contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

11900.7 MANUFACTURER START-UP SERVICES

The Contractor shall coordinate station start-up with Manufactures technical representative. The representative or factory service technician will inspect the completed installation. He will work with the system integrator to calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

11900.8 CLEANING

Prior to acceptance, the Contractor shall inspect interior and exterior of pump station for dirt, splashed material or damaged paint and clean or repair accordingly. The Contractor shall remove from the job site all tools, surplus materials, scrap and debris.

11900.9 PROTECTION

The pump station should be placed into service immediately. If operation is delayed, station is to be stored and maintained per Manufacturers written instructions.

11900.4 METHOD OF MEASUREMENT

11900.4.1 Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

11900.4.2 Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured at the unit rates for each item listed.

11900.5 BASIS OF PAYMENT

11900.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

11900.5.2 When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

The accepted quantity of work will be paid for at the contract unit price for:

PAY ITEM	UNIT
Lift Station	Lump Sum

POLYBLEND® MAGNUM MODEL MM601-P3AB
11910SP SPECIFICATIONS

PART 1 GENERAL

1.01 DESCRIPTION

A. The polymer system shall be the standard equipment of the supplier involved in the manufacture of similar type equipment and shall be the PolyBlend® Magnum Model MM601-P3AB as manufactured by UGSI Chemical Feed, Inc.

B. Equipment included with the polymer system includes:

1. Mixing Chamber

2. Dilution water controls

3. Neat polymer pump

4. System Controls

C. The polymer system shall be a skid mounted system with interconnecting piping and wiring complete within skid limits.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Multi-Zone Mixing Chamber and Post-Dilution

1. Polymer and water shall be mixed in a chamber designed to create sufficient mixing energy.
   a. High shear zone of the mixing chamber shall have a mechanical mixing impeller for successful initial activation and the low shear zone shall not have a mixing impeller to avoid damaging polymer molecules.
   b. Solution shall undergo a tapered mixing intensity slope as it exits the initial high sheer zone and passes through a second low shear zone, isolated by a baffle.
   c. The design shall have primary mixing and post-dilution to maximize the value of breaker surfactant present in emulsion polymer, as per the AWWA Standard for Polyacrylamide (ANSI/AWWA B453-06).
   d. Polymer activation efficiency shall be consistent over the dilution water range.

e. The volume of the mixing chamber shall be a minimum of 1.0 gallon to provide sufficient residence time for activating and disentangling polymer molecules.

2. Mixing chamber shall be transparent with acrylic barrel to allow viewing of mixing intensity. Opaque mixing chambers shall be unacceptable.

3. Impeller shall be driven by a 1 HP maximum washdown duty motor.
   a. Motor shall be TEFC.
   b. Impeller speed shall be 3450 rpm, minimum.
   c. Motor shall be direct coupled to impeller shaft.

4. Mixing chamber shall include a stainless-steel injection check valve.

5. Mixing impeller shall be cast brass construction with holes drilled on the backside of the impeller. The impeller, when rotating, shall pull fluid from around the mechanical seal pocket to eliminate the need for a separate mechanical seal flushing system.

6. In order to quantify the mixing intensity in the mix chamber, the applied horsepower shall be defined by measuring the difference in torque when the mix chamber is empty versus being full of water. This value shall be the basis of determining the mixing intensity defined as "G" value.

7. The G-value in the high shear mixing zone shall exceed 14,000 sec^{-1} to effectively disperse polymer gels to prevent fisheye formation.

8. The G-value in the low shear mixing zone shall be lowered to 3,500 sec^{-1} to avoid damaging polymer chains.

B. Dilution Water Control

1. Dilution water shall be split into two streams.
   a. Primary water flow shall supply the mixing chamber.
   b. Secondary water flow shall be used to post dilute the activated polymer stream.
   c. These two streams shall be completely blended by a static mixer prior to exiting the unit.
   d. Each stream shall have an electronic flow sensor with immersed in-line element capable of transmitting a signal to the unit microcontroller for display of flow rate.
   e. Each stream shall have a rate control valve for isolation of or throttling of water flow.

2. Unit shall have an electric solenoid valve for on/off control of total dilution water flow. Valve shall have brass body with NBR seals and NEMA 4X rated coil enclosure.

3. Dilution water and solution output connections shall include 304 stainless steel unions connected to the chassis.

C. Pump

1. Unit shall have a neat polymer metering pump.
   a. Pump shall be positive displacement, progressing cavity type.
   b. Rotor shall be 316 stainless steel.
   c. Stator shall be Viton.
   d. Pump shall have mechanical seal. Pumps supplied with packing seals shall not be considered equal.
   e. Rotor speed shall not exceed 500 rpm.

2. Pump shall be driven by a ½ HP, TEFC, AC motor.
   a. Variable speed shall be provided by a VFD controller.
   b. Motor shall be direct coupled to a gear reducer.
   c. Pump shall be direct coupled to gear reducer.

3. Pump shall include a pressure relief valve and pressure gauge located on the discharge side of the pump and piped to the pump suction. Pressure relief valve shall be PVC construction with Viton seals. Systems utilizing pressure relief on the mix chamber discharge and requiring a connection to drain shall not be considered equal.

4. A suitably sized calibration cylinder shall be mounted to the frame with PVC isolation ball valves. Cylinder shall be calibrated in mL and be constructed of clear PVC with slip on cap and ½ inch NPT vent connection.

D. Controls

1. Unit shall be operated with a programmable microcontroller.
   a. Controller shall have polycarbonate touchpad membrane with four-digit LED readout.
   b. Enclosure shall be non-metallic and of waterproof design.

2. A VFD shall be supplied to vary pump speed. A keypad shall be mounted on the motor control enclosure for VFD control and display.
   a. VFD shall accept single phase power and convert it to three phase output.
   b. Up/Down arrows shall control motor speed in manual mode.
   c. VFD shall accept 4-20 mA input signal to vary pump speed in automatic mode.

3. Unit shall accept a 4-20 mA analog signal to pace the polymer metering pump.

a. The controller shall also have manual motor speed control via a potentiometer for touchpad for VFD.

4. Microcontroller shall pace polymer metering pump based on operator programmed data or based on a 4-20 mA analog input signal.
   a. Operator shall be able to determine mode of operation at touchpad, internal or external.
   b. Internal mode shall allow for automatic polymer pump pacing based on programmed setpoint.
   c. Operator shall be able to enter a make up concentration setpoint.
   d. Controller will compute a ratio of polymer to water from primary dilution water flow rate signal generated by flow element.
   e. Controller will generate signal to pace pump accordingly.
   f. As primary dilution water flow changes, setpoint concentration will be automatically maintained by controller.
   g. External mode shall allow for automatic polymer pump pacing based on a 4-20 mA analog input signal.

5. Unit shall be controlled through an on-off-remote circuit.
   a. In the remote mode, the unit shall accept a run signal.
   b. Unit is manually controlled in the on mode.
   c. Controller shall indicate mode of operation with LED.

6. Unit shall detect loss of water flow, sensing that water flow has been interrupted for any reason, will place the polymer pump and mix chamber on standby and will restart it automatically when flow is restored.

7. An integral timer shall monitor loss of flow and energize contacts indicating alarm after 15 seconds of continuous loss.
   a. Controller shall indicate loss of water alarm with LED.

8. Controller LED display shall indicate:
   a. Primary water flow
   b. Secondary water flow
   c. Polymer flow
   d. Make up solution concentration in mixing chamber
   e. Discharge solution concentration including post dilution

9. Controller shall have pre-programmed auto-flush cycle which will disable polymer pump yet allow dilution water to flow through system for a pre-set time at each shutdown.

10. Controller shall have 4-20 mA output signal which is proportional to polymer pump speed.

11. Controller shall have dry contacts for these outputs:
    a. General alarm

b. Run status

12. Controller shall have additional LED indication of these:
    a. Loss of water flow alarm
    b. One (1) additional configurable alarm
    c. Run status

2.02 TECHNICAL DATA

A. Connections – Plumbing

1. Dilution water inlet, 1" FNPT

2. Neat polymer inlet, ½" FNPT

3. Solution discharge, 1½" FNPT

B. Connections – Electrical

1. Voltage – 120 VAC / 1 Phase/ 60 Hz - 17 amps

2. Terminal blocks – 4-20 mA signal input

3. Terminal blocks – dry contact input for remote start

4. Terminal blocks – dry contact alarm output

5. Terminal blocks – dry contact run output

C. Dimensions

1. Frame – 37" wide x 28" deep x 47" high (94x71x120 cm)

D. Materials of Construction

1. Structural frame – 304 stainless steel

2. Plumbing – PVC, nylon, stainless steel

3. Mixing chamber – PVC, acrylic

E. Performance

1. Dilution water – 30-300 GPH primary mixing (114-1135 LPH)
   30-300 GPH post dilution (114-1135 LPH)
2. Metering pump – 0.15-3.0 GPH neat polymer (0.57-11.3 LPH)

PART 3 EXECUTION

3.01 INSTALLATION

A. The equipment shall be installed per the contract documents and manufacturer's recommendations.

3.02 WARRANTY

A. The standard warranty extends for a period of twelve (12) months from the date of start-up by an authorized UGSI technician or eighteen (18) months from the date of shipment, whichever occurs first.

B. Damage due to makeup water particulates will not be considered as a warranty defect and will be the responsibility of the owner.

PART 4 OPTIONAL ACCESSORIES

A. Pressure reducing valve: A suitably sized pressure reducing valve shall be supplied for installation in the dilution water line. Pressure reducing valve shall be constructed of bronze with adjustable output pressure of 25-75 psig to reduce incoming line pressure variations. Pressure reducing valve shall be as manufactured by Watts.

B. Drumstick: A rigid drumstick suitable for mounting in the neat polymer drum bung or vent connection shall be supplied to completely evacuate the drums contents. The drumstick shall be supplied with 2-inch NPT and ¾ inch NPT connections for connection to either port. Drumstick construction shall be PVC.

C. Drum Mixer: A bayonet mount drum mixer shall be supplied for mixing neat polymer drum contents. Mixer shall include a ½ hp, 1725 rpm TEFC motor with 28-inch-long mixer shaft, two 4-inch-long collapsible mixing blades, 8-foot power cord and on/off switch. Mounting plate shall include 2-inch bung mount and shall be constructed of mild steel with powder epoxy coating. Electrical requirements shall be 120 VAC/ 1 phase/ 60 Hz.

D. Drum Dryer: A desiccant drum dryer shall be supplied to eliminate moisture laden air from entering the polymer drum. The drum dryer shall include a ¾ inch connection for mounting in the drum vent port.

E. Drum Dolly: A drum dolly/cradle shall be supplied for moving drums or tipping the drum on its side for dispensing. Polyolefin wheels and rollers shall be supplied for moving or positioning the drum, a kickstand shall be supplied to support the drum dolly in an upright position. Drum dolly shall have a 1-inch structural pipe frame, 1000 lb. capacity and suitable coating for corrosion prevention.

F. A neat polymer thermal loss of flow switch shall be supplied on the discharge of the neat polymer metering pump to detect absence of polymer flow. Thermal flow switch assembly shall include sensor, flow block and controls. Alarm output contacts shall be supplied for the plant control system after adjustable time delay.

G. Spare parts kit: Spare parts kit shall include mechanical seal, mixing chamber o-rings, injection check valve, and pump stator.

15110.1 DESCRIPTION

This section is a materials specification and is included for guidance in selecting materials for pipe and related fittings and appurtenances used in the construction of water and sewer systems.

15110.1.1 RELATED WORK

Section 02222 - Waterline Pipe Installation
Section 02224 - Sewer Line Pipe Installation
Section 15230 - Waterline Valves and Hydrants
Section 15232 - Water System Control Valves

15110.1.2 SUBMITTALS

The Contractor shall submit for review complete information, showing all pipe, materials, fittings, gaskets, couplings, coatings, linings, supports, mechanical restraints, thrust blocks and configuration prior to the delivery of any components to the project. All information shall be provided in accordance with Section 01300 and written evidence of compliance from the manufacturer shall accompany each delivery of material.

15110.1.3 DEFINITIONS

Not used.

15110.2 MATERIALS

15110.2.1 NSF COMPLIANCE

All pipe and materials furnished and installed for culinary use shall comply with National Sanitary Foundation (NSF) Standard 61. Also, all plastic pipe must be approved by the NSF for potable water use and shall carry the factory "NSF " stamped label on the pipe indicating such approval.

15110.2.2 POLYVINYL CHLORIDE PIPE (PVC)

15110.2.2.1 PIPE – Shall be as follows:

- For sizes less than 4 inches OD, PVC pipe shall be Schedule Rated pressure pipe meeting the requirements of ASTM D1785 of the schedule and size shown on the Drawings.
- PVC pipe 4 inches and larger, shall be rigid, thermoplastic Class Rated pressure pipe meeting the requirements of ANSI/AWWA Standard C900 or C905 (latest revision). The pressure class or the dimensional ratio and the size shall be as shown on the Drawings.
- While Class Rated and Pressure Rated pipe materials are not interchangeable, when specifically allowed in the Contract Documents, for size 4" and larger, rigid thermoplastic Pressure Rated pressure pipe, meeting the requirements of ASTM D2241, may be furnished and installed. Operating pressure for this pipe shall be as shown on the Drawings.

15110.2.2.2 FITTINGS FOR PVC PIPE – Unless specifically authorized otherwise, fittings for 4 inch and larger size PVC pipe in underground service shall be ductile iron (DI) and shall meet the requirements of NSF 61 and ANSI/AWWA C-153. They shall have a standard coating of cement mortar on the interior surfaces in complies with AWWA C-104. DI fittings meeting these requirements may be used with smaller PVC piping. PVC fittings meeting the requirements of ANSI/AWWA C-907 may be used with PVC pipe smaller than 4 inches, and, in some instances, where specifically authorized, with PVC pipe sizes 4 inches through 8-inches.

15110.2.3 DUCTILE IRON PIPE

15110.2.3.1 INTERIOR COATING - The interior surface of all DI pipe shall be coated with a standard coating of cement-mortar in accordance with ANSI/AWWA Standard C-104 unless required otherwise in the Contract Documents. Field coating of DI pipe will not be acceptable.

15110.2.3.2 BURIED PIPE – Unless shown otherwise on the Drawings, shall be as follows:

- Buried ductile iron pipe shall be Thickness Class 51.
- Shall meet requirements of ANSI/AWWA C-151.
- Joints shall be bell and spigot or mechanical, which meet the requirements of ANSI/AWWA C-111.

15110.2.3.3 EXPOSED PIPE – Shall meet these requirements, unless shown otherwise on the Drawings:

- Exposed ductile iron pipe shall be Thickness Class 53.
- Pipe shall comply with ANSI/AWWA Standard C-151.
- Pipe joints shall be flanged, meeting the requirements of ANSI/AWWA C-115, or mechanical type couplings (MTC), meeting the requirements of ANSI/AWWA C-606. MTC shall be Victaulic grooved couplings, as manufactured by Victaulic Company of America or approved equal), unless shown otherwise on the drawings.
- 3" to 12" compact flanged fittings shall be ductile iron and shall be produced in accordance with laying lengths specified in ANSI/AWWA C10/A21.10. Flange surface shall be faced and drilled in accordance with ANSI Class 125 B16.1. Nominal body thickness shall be Manufacturer's Standard, but shall not be less than those specified in ANSI/AWWA C153/A21.53 "Standards for Ductile Iron Compact Fittings". Flange thickness shall be in accordance with the Manufacturer's Standards. Working pressure rating shall be 250 psi for water. Fittings shall be made in the United States of America and shall not have been refurbished or reworked by anyone other than the manufacturer. When greater than 250 psi is called for on the plans, then the Supplier shall furnish higher class rated flanges. Standard Class 125 template for drilling shall be used for all flanges. Drilling templates shall be in multiples of four, so that fittings may be made to face in any quarter. Boltoles shall straddle the centerline and shall be equally spaced. Misalignment of boltholes of two opposing flanges shall not exceed 0.12 inches. Blind flanges 12 inches and over shall be provided with lifting eyes. Insulated flanges shall be provided where required.
- Gaskets shall be full faced, 1/16-inch thick compressed sheets of Aramid fiber base, with nitrile binder and non stick coating, suitable for temperatures to 700°, pressures to 1000 psig and a pH range of 1 to 11. Blind flange gaskets shall cover the entire inside face of the flange and shall be cemented in place. Gaskets shall be as manufactured by John Crane, style 2160; Garlock, style 3000; or approved equal.

15110.2.4 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

15110.2.4.1 PIPE – Shall be as follows:

- PE pipe shall be classified as a Type III, Grade P-34, Class C, Category 5, according to ASTM D1248. All PE pipe shall be manufactured according to ASTM D2513 D3035, F714, or API 15LE and AWWA C906.

- Pipe shall be made of high density, high molecular weight resin. PE plastic shall have a cell classification of 345434C as defined by ASTM D3350/AWWA C906. It shall be rated as PE3408 according to the requirements of the Plastics Pipe Institute. Internal pressure rating shall be as specified elsewhere in the project documents.

15110.2.4.2 FITTINGS FOR HDPE – Molded fittings shall be made of pre-blended virgin resins in accordance with the materials specifications of ASTM D1248. PE3408 fittings shall be made from a Type III, Class C, Category 5, Grade P-34 plastic resin having a cell classification of 345434C according to ASTM D3350. Socket fusion fittings shall be manufactured in compliance with ASTM D2683 and butt fusion fittings with ASTM D3261. Measurements of fittings shall be as required by ASTM D2122. All fittings shall be compatible for heat fusion with any pipe manufactured for like or similar resins.

Heat welded Flange Adapter Couplings shall be used for transition to other type piping material. The Contractor shall follow the manufacturers recommendations, as well as specified procedures herein in fusing fittings to the polyethylene pipe.

15110.2.5 GALVANIZED IRON PIPE AND FITTINGS

Shall be of the schedule rating shown on the Drawings and shall be used only in exposed, non-corrosive atmospheres where piping diameters are less than 4 inches.

15110.2.6 PIPE AND FITTINGS FOR WATER SERVICE LINES

Shall meet the requirements provided in Section 15234 for water service connections.

15110.2.7 PIPE FOR GRAVITY SEWER SYSTEMS

Gravity sewer pipelines may be constructed with PVC or polyethylene (PE) plastic sewer pipe and fittings. Such materials shall be of the type, configuration and size shown on the Drawings and/or on the Bid Schedule.

15110.2.7.1 PVC PIPE - All PVC sewer pipe and fittings shall meet the standards of ASTM D3034 and F679. Such pipe shall be manufactured with a rubber gasketed joining system which meets ASTM D3212 and shall be furnished with a standard dimensional ratio of 35 (SDR 35) for wall thickness, unless shown otherwise on the Drawings.

15110.2.7.2 PE PIPE - All PE sewer pipe and shall be smooth, solid wall, high density polyethylene pipe manufactured from PE 3408 material conforming to ASTM D1248, Type III, Class C, Category 5, Grade P34 with a P3408 rating from the Plastic Pipe Institute. Fittings for this pipe shall be molded from a polyethylene compound equal to or exceeding the properties of the pipe being supplied.

15110.2.8 PIPE FOR PRESSURE SEWER SYSTEMS

Pressure sewer pipelines shall be constructed with DI, PVC, or PE plastic sewer pipe. Fittings and materials shall be of the type, SDR rating, (or pressure class) and size shown on the Drawings and/or on the Bid Schedule.

15110.2.8.1 PVC PIPE - All PVC pipe for pressure sewer lines shall be rigid, pressure rated, thermoplastic pipe which meets the standards of ASTM D2241. Fittings for PVC pipelines shall be Class 50, cement mortar lined, rubber gasketed, DI which meet the requirements of ANSI/AWWA C-153 and C-104.

15110.2.8.2 PE PIPE - PE pipe for pressure sewer lines shall be smooth, solid wall, high density polyethylene pipe manufactured from PE 3408 material conforming to ASTM D1248, Type III, Class C, Category 5, Grade P34 with a P3408 rating from the Plastic Pipe Institute. Fittings for this pipe shall be molded from a polyethylene compound equal to or exceeding the properties of the pipe being supplied.

15110.2.9 PIPE AND FITTINGS FOR IRRIGATION SYSTEMS

Shall be either DI or Pressure Rated PVC, of the type and class shown on the Drawings, for line diameters 4-inches and greater. Buried lines smaller than 4 inches in diameter shall be Schedule Rated PVC as shown on the Drawings.

15110.2.10 PIPE FOR DRAIN SYSTEMS

Piping for sub-drainage may be constructed with polyvinyl chloride (PVC) or polyethylene (PE) plastic non-pressure drainage or sewer pipe and fittings. Such materials shall be of the type, configuration and size shown on the Drawings and/or on the Bid Schedule.

15110.2.10.1 PVC PIPE - All PVC drainage pipe and fittings shall meet the standards of ASTM F794. Such pipe shall be manufactured with a rubber gasketed joining system which meets ASTM D3212 and may be furnished with ribbed, corrugated or smooth exterior walls with smooth interior wall surfaces, unless shown otherwise on the Drawings. Rubber gasketed joints will not be required for collection pipe applications with perforated or slotted pipe sections.

15110.2.10.2 PE PIPE - All PE drainage pipe shall be solid, corrugated or ribbed wall high-density polyethylene pipe with smooth interior wall surfaces. Material shall conform to ASTM D1248, Type III, Class C, Category 5, Grade P34 with a P3408 rating from the Plastic Pipe Institute. Fittings for this pipe shall be molded from a polyethylene compound and with equivalent properties and configurations specifically designed to fit the pipe being supplied.

15110.2.11 MISCELLANEOUS FITTINGS AND MATERIALS

15110.2.11.1 PIPE SUPPORTS - Floor mounted pipe supports for suspended, exposed piping systems shall be adjustable stanchion type supports designed to cradle the pipe diameter by 170 degrees. The support shall fit ductile iron or steel diameters snugly, without excessive gaps between the support and the pipe. Support saddle width shall be a minimum of 2 inches wide. The support must offer a minimum of 3 inches of final adjustment, after installation. Supports shall be supplied with independent base and adjustment collar designed to accept standard sized Schedule 40 galvanized steel pipe for coarse adjustment. Supports shall be fabricated from A36 mild steel, and shall have an electro-galvanized finish. Floor mounted pipe supports shall be the Standon Model S92 or C92 as manufactured by Material Resources, Inc., 22700 N. W. Quatama Street, Hillsboro Oregon 97124, or approved equal. The standard required model shall be the S92. Non standard materials or model numbers shall be as specified on the Drawings.

15110.2.11.2 "Y" STRAINERS - shall be constructed of high-tensile ASTM A126 Class B Cast Iron with blow-off connections and self-aligning cylindrical screens and shall be equal to Watts Regulator Series 77F or better quality.

15110.2.11.3 FASTENERS – Fastener requirements are as follows:

- Unless otherwise required in these Specifications or shown on the Drawings, all bolting hardware for buried pipe, fittings, valves, and components shall be of manufacturer's standard materials.

- Unless otherwise required in these Specifications or shown on the Drawings, all bolting materials for exposed pipe, fittings, valves, and components shall be Type 316 stainless steel. Where space restrictions preclude the use of regular bolts, stainless steel threaded studs may be used on all valve flange connections.

- In all instances where stainless steel threaded fasteners are used, a coating of an approved, permanent anti-seize compound shall be applied to the fastener to prevent galling and to assist in disassembly.

- All bolts and/or studs shall extend through the nuts at least 1/4 inch.

15110.2.11.4 COUPLINGS – Couplings shall meet the following requirements:

- Unless prescribed otherwise on the Drawings or in these Specifications, couplings shall meet the requirements of ANSI/AWWA C-219. All flexible couplings shall meet the minimum requirements of Smith Blair 400 series.

- Sleeves shall have a smooth inside taper and there shall be no surface irregularities on any sealing surface. Gaskets shall be suitable for the project application.

- Flexible couplings for buried DI and PVC pipe sizes 2 through 16 inches in diameter shall be fabricated of steel or ductile iron. For pipe sizes larger than 16 inches, flexible couplings shall be of steel. Coupling components for use in potable water systems shall be factory coated with an FDA approved, bonded epoxy coating, applied to an average 12 mil thickness.

- Flexible couplings for exposed pipe shall be manufactured of steel, unless shown otherwise on the Drawings, or approved by the Engineer. Coupling components for use in potable water systems shall be factory coated with an FDA approved, fusion-bonded epoxy coating, applied to an average 12 mil thickness.

15110.2.11.5 RESTRAINT HARNESS – Where required, restraint harness for bell and spigot pipe joints shall be as manufactured by EBAA Iron Co. or an approved equal. The restraint shall consist of a split bell ring to go behind the bell and a split, serrated ring to grip the pipe on the other side of the joint. The harness shall be held together with clamping bolts and tie bolts. The rings shall be fabricated of 60-42-10 DI conforming to ASTM A-536. Clamping bolts shall be grade 5 galvanized machine bolts. Tie bolts are of low alloy steel. The harness shall have a minimum working pressure of 150 psi. Harness size shall be as shown in the schedule on the Drawings or as specified in the Special Provisions.

15110.2.11.6 VALVES AND FITTINGS - Shall be as specified in their respective sections in these Specifications.

15110.2.11.7 BOXES AND ENCLOSURES – Shall be of the size, type, and configuration indicated on the Drawings and Contract Documents.

15110.3 CONSTRUCTION REQUIREMENTS

See Sections 02222 and 02224 for construction requirements for applicable piping systems.

15110.4 METHOD OF MEASUREMENT

In general, fittings for pipe and piping systems are, and will be, considered appurtenant to the pipeline being installed unless specifically called out for separate payment on the Bid Schedule.

15110.5 BASIS OF PAYMENT

Not used.

15120.1 DESCRIPTION

15120.1.1 The CONTRACTOR shall furnish and install all pipe, fittings, closure pieces, supports, gaskets, joining materials, or other appurtenances as shown and specified for a complete and workable plant piping system.

15120.1.2 All pipe and fittings shall be of the type, class, and size designated on the DRAWINGS and as specified in these SPECIFICATIONS. All pipe, fittings, gaskets, solvent cements, and other items or materials installed in a pipeline containing water intended for culinary use shall comply with National Sanitary Foundation (NSF) Standard 61. Also, all plastic pipe must be approved by the NSF for potable water use and shall be stamped "NSF-PW" on the pipe indicating such approval.

15120.1.3 Piping shall be installed as indicated on the DRAWINGS. Pipe size and locations are provided, but the DRAWINGS are not intended to show every offset, fitting, or structural difficulty that may be encountered during project construction.

15120.1.4 Exposed piping shall not be erected until the all equipment to which the pipe is to be attached has been installed and it can be determined where the piping and fittings shall be located to make a neat, effective arrangement. Pipe runs shall be horizontal and vertical and installed in straight runs parallel the axis of the pipe chases.

15120.1.5 If the CONTRACTOR desires to change any of the piping layouts shown on the DRAWINGS, he shall submit to the ENGINEER, for approval, his detailed proposed layouts. Such approved changes shall come at no additional cost to the OWNER. The CONTRACTOR shall provide all materials and labor required to complete all WORK in accordance with the best practice of the trade, and to the satisfaction of the ENGINEER.

15120.1.6 RELATED WORK

Section 02200 - Trench Excavation & Backfill
Special Provision - Tubing Systems
Special Provision - Compressed Air Piping
Special Provision - Pipe Schedule
Special Provision - Sitework Piping
Special Provision - Drain Piping & Manhole Installation
Special Provision - Water Valves
Special Provision - Supports & Anchors

15120.1.7 REFERENCES

15120.1.7.1 Work covered by this Specification shall meet or exceed the provisions of the latest editions of the following Codes and Standards in effect at the time of award of the Contract:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120

ASTM D2564 Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe Fittings

ASTM D2466 Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D2467 Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C 104 Standards for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C 110 Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In. for Water and Other Liquids

AWWA C 111 Standard for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

AWWA C 150 Standard for the Thickness Design of Ductile-Iron Pipe

AWWA C 151 Standard for the Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

AWWA C 600 Standard for Installation of Ductile-Iron Water Mains and their Appurtenances

AWWA C 651 Standard for Disinfecting Water Mains

AWWA C 900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. through 12 In.

AWWA C 905 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 14 In. through 20 In.

AWWA C 907 Standard for Polyvinyl Chloride (PVC) Pressure Fittings

AWWA M 23 Manual of Water Supply Practices - PVC Pipe-Design and Installation

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16 Bolt Hole Pattern for Pipe Flanges and Flanged Fittings

15120.1.8 SUBMITTALS

15120.1.8.1 The CONTRACTOR shall submit for review complete information, showing all pipe, fittings, gaskets, solvent cements, and other appurtenant materials were manufactured, tested and supplied in accordance with applicable references in this section together with a report of the test results and the date each test was completed. All information shall be provided in accordance with Section 01300 and written evidence of compliance from the manufacturer shall be provided with each delivery of material.

15120.1.8.2 As construction proceeds, the CONTRACTOR shall submit test documentation in accordance with Section 15120.3.5 of these SPECIFICATIONS.

15120.2 MATERIALS

15120.2.1 POLYVINYL CHLORIDE PIPE (PVC) - All exposed plant piping shall be rigid thermoplastic pressure pipe meeting the requirements of ASTM D1785, Schedule 40 (unless otherwise specified), and of the size shown on the DRAWINGS.

15120.2.2 PVC FITTINGS - Fittings for PVC piping shall meet the requirements of ASTM D2466 and ASTM 2467, of the schedule and size shown on the DRAWINGS.

15120.2.3 THERMOPLASTIC FLANGES - Flanges for PVC piping shall be Van Stone style and of the size and type shown on the DRAWINGS. Flanges shall meet the requirements of ASTM D2467 and ASTM D4024.

15120.2.4 PVC SOLVENT CEMENTS- Solvent cements for PVC piping shall meet the requirements of ASTM D2564 and the National Sanitary Foundation (NSF) Standard 61.

15120.2.5 DUCTILE IRON PIPE (DI) - All buried plant piping shall be DI Pressure Class 300, meeting the requirements of ANSI/AWWA Standards C-150 and C151 with push-on, mechanical, or flanged joints as shown on the DRAWINGS. Unless directed otherwise on the DRAWINGS or in these SPECIFICATIONS, the interior surface of all DI pipe shall be factory coated with a standard coating of cement-mortar, which shall be further covered with a bituminous seal coat, all in accordance with ANSI/AWWA Standard C-104. Field coating of DI pipe will not be acceptable or allowed.

15120.2.6 DUCTILE IRON FITTINGS - Fittings for DI piping shall be push-on, mechanical, or flanged as shown on the DRAWINGS and shall meet the requirements of ANSI/AWWA C-110 with a standard factory coating of cement-mortar on all interior surfaces, which shall be further covered with a bituminous seal coat, all in accordance with ANSI/AWWA Standard C-104 on the interior surfaces. Field coating of DI fittings will not be acceptable or allowed. Pressure rating for fittings shall be as required to meet or exceed the pressure rating of the piping.

15120.2.7 DUCTILE IRON FLANGES - Flanges shall be the size, class, and fitted with gaskets, in accordance with the requirements of ANSI/AWWA C-110. Mating surfaces of all flanges shall be protecting against rusting. Class D, 150 PSI flanges shall be provided when not otherwise shown on the DRAWINGS.

15120.2.8 GALVANIZED IRON PIPE AND FITTINGS - Galvanized pipe and fittings shall be schedule 80 unless otherwise shown on the DRAWINGS and used only in exposed, non-corrosive atmospheres where piping diameters are less than 4 inches.

15120.2.9 GASKETS - Gaskets shall be full faced, 1/8 inch thick EPDM. Blind flange gaskets shall cover the entire inside face of the flange and shall be cemented in place. Gaskets shall be as manufactured by ASAHI America, Inc., or approved equal.

15120.2.10 BOLTS - ALL bolts, nuts, hardware, and fasteners for fittings, valves, and piping components shall be Stainless Steel, Type 316 unless specifically approved otherwise by the ENGINEER in writting.

15120.2.11 THREAD COMPOUND - All nut and bolt threads shall be coated with an anti-seize thread compound, Product 767, as manufactured by Loctite Corporation (860/571-5100), or approved equal.

15120.3 CONSTRUCTION REQUIREMENTS

15120.3.1 HANDLING AND REJECTION OF MATERIALS

15120.3.1.1 Care shall be taken during handling of pipe, to avoid impact which might cause damage. Dropping pipe during unloading will not be permitted.

15120.3.1.2 Pipe will be carefully inspected in the field before installation. If any cause for rejection is discovered in a pipe before or after installation, it shall be removed and replaced by the CONTRACTOR, at no additional cost to the OWNER.

15120.3.1.3 Any pipe found to be unfit or rejected due to cracks, broken bells or spigots, irreparable chipped lining, etc., shall be removed from the job site.

15120.3.2 INSTALLATION

15120.3.2.1 When making connections, pipe shall be cut in a neat and workmanlike manner, so as to provide a

smooth end at right angles to the axis of the pipe. Pipe and fittings shall be assembled so there will be no distortion or springing of the pipelines. Fittings, flanges, and any other connections shall come together at the proper orientation. The fit shall not be made by springing piping, nor shall orientation or alignment be corrected by taking up on any flange bolts. Flange bolts, mechanical joints, flexible connectors, etc., shall slip freely into place. If the proper fit is not obtained, the piping shall be altered to make the fit meeting the above requirements.

15120.3.2.2 At the close of each work day, or whenever the work ceases for any reason, the end of the pipe shall be securely closed, unless otherwise permitted by the ENGINEER.

15120.3.2.3 Exposed piping shall not be installed until all equipment to which the pipe is to be attached has been installed and it can be determined where piping and fittings shall be located to make a neat, efficient arrangement. Piping shall be aligned with equipment connections such that no external load or stress will be transferred to any equipment from the piping. Pipe runs shall be horizontal and vertical and installed in straight runs parallel to the axis of the pipe chases. Piping shall be installed to allow for convenient inspection and maintenance.

15120.3.2.4 All piping shall be painted in accordance with Section 9910 of these SPECIFICATIONS and color coded according the following table. Identification of the direction of flow and the contained liquid or piping system (i.e. “Raw Water”, “House Water”, “Finished Water”, “Chlorine Gas”, etc.) shall also be made on the pipe. The color and type of paint used shall be submitted to the ENGINEER for his approval.

Color Scheme for Piping

Raw	Olive Green
Potable	Dark Blue
Backwash Waste	Light Brown
Sludge	Dark Brown
Natural Gas	Red
Other Lines	Light Gray

15120.3.3 PIPE RESTRAINTS

Above ground or exposed piping shall be restrained as required in Section 15275 - Supports and Anchors.

The CONTRACTOR shall provide mechanical pipe restraints in accordance with the DRAWINGS and these SPECIFICATIONS. All restraints shall be in place before any hydrostatic testing is performed on the system. Pipe shall be properly blocked or restrained at all fittings wherever the pipeline makes a sudden change in direction of 11.25 degrees or more, wherever it changes sizes, or wherever it ends. Restraints shall be installed in accordance with the details shown on the DRAWINGS.

The CONTRACTOR shall allow the ENGINEER to visually inspect every mechanical restraint before it is buried.

15120.3.4 FLUSHING AND CLEANING - Prior to proceeding with pressure testing and disinfection of completed lines, the CONTRACTOR shall fill the test section with clean potable water and flush the lines. Certain contaminants, especially in caked deposits, resist flushing at any velocity. If, in the opinion of the ENGINEER, contaminants have entered the line during construction that will not be removed by flushing, the interior of the pipe shall be pigged or swabbed, as necessary, to remove the debris prior to proceeding with flushing.

15120.3.5 TESTING

15120.3.5.1 The CONTRACTOR shall perform all testing, and shall furnish all materials, equipment, and labor necessary to complete this WORK as required. Any WORK that fails to meet the acceptance criteria of prescribed testing, shall be repaired and/or replaced at no additional cost to the OWNER and then re-tested. This sequence shall be repeated until the WORK meets the acceptance criteria

15120.3.5.2 PRESSURE TESTING

15120.3.5.2.1 All pipelines for carrying potable, non-potable, and water-borne products shall be pressure tested for leakage when they are completed, unless directed otherwise in these SPECIFICATIONS or in writing by the ENGINEER.

15120.3.5.2.2 WARNING - The hydrostatic test procedures described herein are not applicable to air pressure testing.

15120.3.5.2.3 Prior to pressurization all required flushing shall have been completed. Pipeline sections to be tested shall be isolated. The test section shall be filled with clean potable water, and all air shall be removed from the line. Pressure on the test section shall then be brought to full test pressure and maintained at that level for a period of not less than 4 hours. Pipelines shall be tested at 50 PSI over normal static pressures or to the manufacturer's class rating, which ever is lower.

15120.3.5.2.4 No leakage will be allowed in the plant piping system. Should any leaks be discovered, the CONTRACTOR shall locate and repair the leak, and shall then be re-tested by the CONTRACTOR until compliance is achieved.

15120.3.6 DISINFECTION

15120.3.6.1 All pipelines to be used for culinary water shall be disinfected in accordance with the requirements of the latest revision of ANSI/AWWA C-651, the State of Utah Public Drinking Water Regulations and local requirements.

15120.3.6.2 The CONTRACTOR may use any method prescribed by the referenced standards; however, the "slug method" is preferred. This method basically consists of filling the line with potable water and then injecting a "slug" of concentrated chlorine solution (100 mg/L) at the upstream end of the line. The "slug" is then moved through the line by slowly draining the low end. When properly conducted, this procedure provides contact to the interior pipe surfaces with a heavily concentrated dose of chlorine to achieve disinfection.

15120.3.6.3 After disinfection, the lines are flushed until residual chlorine is reduced to the levels found in the rest of the OWNERS system, or until they reach levels safe for consumption. Samples for bacteriological testing can then be taken. The CONTRACTOR shall safely and legally dispose of contaminated water used for disinfection after consultation with the local authorities. Under no circumstances shall heavily chlorinated water be allowed to mix with "live" waters, meaning waters in lakes, rivers, streams or wetlands.

15120.3.7 TESTING DOCUMENTATION

The CONTRACTOR shall maintain a record of all testing performed, and the test results obtained for the lines installed under this CONTRACT. Minimum information contained on the record shall include the following:

1. All Documents:

   A. Date of issuance of the record
   B. Name of CONTRACT
   C. CONTRACTOR's name and address

2. Disinfection Report:

   A. Name and address of treatment supervisor
   B. Disinfection method used
   C. Location and boundary description of section to be disinfected
   D. Time and date of disinfectant introduction
   E. Time and date of disinfectant release
   F. Initial disinfectant residual (ppm) for each outlet tested
   G. Time and date of flushing after disinfection
   H. Signature of treatment supervisor (signifies completion of disinfection activities)

3. Bacteriological Report:

   A. Date issued
   B. Project name and location
   C. Laboratory's name, certification number, address and phone number
   D. Test location
   E. Time and date of sample collection
   F. Name of person collecting sample
   G. Time and date of laboratory test start
   H. Coliform bacteria test results for each sample
   I. Certification that water conforms (or fails to conform) to bacterial standards of State of Utah public drinking water regulations
   J. Bacteriologist's signature

4. Pressure Test Report:

   A. Type of test
   B. Location of test
   C. Sizes, types, and lengths of pipe in test section, and test boundary description
   D. Date and Time test started
   E. Date and Time test completed
   F. Test pressure
   G. Amount of leakage
   H. Test result
   I. Printed Name/Signature and Date of Test Supervisor (CONTRACTOR's representative)
   J. Printed Name/Signature of Inspector (ENGINEER’s representative) witnessing and approving the test

15120.4 METHOD OF MEASUREMENT

Unless a separate bid item for furnishing and installing the work outlined in this section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

15120.5 BASIS OF PAYMENT

Not used.

15223.1 Re-use Pumps

15223.1.1 There will be three pumps controlled by VFD's that will pump water from the wet well after UV disinfection to the yard hydrants and non-potable plant wash down system. These pumps are to maintain an operator defined pressure in the yard hydrants and non-potable plant wash down system. Each pump will have its own Hand, Off, Auto (HOA) switch. When turned to Hand mode, the pump will turn on and stay on until the switch is turned to the Off or Auto position. In Auto mode, the VFD's will control the pumps according to the system pressure.

15223.1.2

Make and model:	Grundfos Model 85S75-5 (design basis) or approved equal.
Number of Pumps:	3
Type:	Multi-Stage Submersible Pump for raw water supply
Flow:	100 gpm
Pump Speed:	3450 rpm
Resulting head of pump:	140 ft
Pump outlet:	3" NPT
Actual Impeller Diamter:	3.49 in
Rated Power:	7.5 HP
Main Frequency:	60 Hz
Voltage:	3 x 440-460-480V
Materials of construction:	
Pump:	Stainless steel AISI 304
Impeller:	Stainless steel AISI 304
Motor:	Stainless steel AISI 304

Mounting hardware: Pump Can with perforated bottom and anchored at floor of wet well.

15223.1.3 This specification only covers the pumps specified above. Installations shall be completed as specified by the manufacturer.

15230.1 DESCRIPTION

This section covers furnishing and installing valves and fire hydrants in water transmission and distribution lines, together with fittings, thrust blocking, and boxes and enclosures related to the operating equipment.

15230.1.1 RELATED WORK

Section 02222 - Waterline Pipe Installation
Section 15110 - Pipe and Piping Systems
Section 15232 - Water System Control Valves

15230.1.2 SUBMITTALS

All information shall be provided in accordance with Section 01300. Written evidence of compliance from the manufacturer shall accompany each delivery of material.

15230.1.2.1 VALVES 12 INCHES AND SMALLER, AND HYDRANTS - For valve sizes 12-inches and smaller, and fire hydrants, the Contractor shall furnish the manufacturer's standard data and catalogues for review and approval.

15230.1.2.2 VALVES LARGER THAN 12 INCHES - For all valves sized larger than 12-inches, the Contractor shall furnish shop drawings and technical data prepared by the manufacturer for review and approval.

15230.1.2.3 CONTENT - Submittals shall include complete details, dimensions, weights, diameter of stems, alloy for all valve parts and any information that may be required to assemble, install, operate and maintain the valve.

15230.1.2.4 BUTTERFLY VALVES - Certification of performance together with leakage and hydrostatic tests as described in Section 13 of ASTM/AWWA C-504 shall be furnished to the Engineer upon the Engineer's request.

15230.1.2.5 BALL VALVES - Certification of performance together with leakage and hydrostatic tests as described in Section 5 of ASTM/AWWA C-507, shall be furnished top the Engineer upon the Engineer's request.

15230.1.3 DEFINITIONS

Not used.

15230.2 MATERIALS

15230.2.1 GATE VALVES

15230.2.1.1 COMPLIANCE - All gate valves shall conform to AWWA C-500 or C-509 with the following characteristics:

15230.2.1.2 3-INCH AND SMALLER VALVES - Valves 3-inches and smaller shall be as follows:

- Valves shall be as manufactured by Ford, Hayes, Mueller, Red & White, or an approved equal.
- Valves shall be standard, double-disc, non-rising stem valves with wheel handles.
- Valve bodies shall be all bronze or brass.

- Valves shall be threaded, unless shown otherwise on the Drawings or required in these Specifications.

15230.2.1.3 GATE VALVES 4-INCH THROUGH 14-INCH - Gate valves 4-inches through 14-inches in size shall be as follows:

- Valves shall have a ductile iron body.
- Valves shall have a solid cast iron, rubber coated, wedge gate and a resilient seat.
- Gate shall be designed to work equally well with pressure on either side of it.
- Valves shall be of the non-rising stem type and shall be left hand opening (counter-clockwise) with a 2-inch square operating nut.
- All interior ferrous surfaces exposed to fluid flow shall have an NSF approved, fusion bonded, epoxy coating. Epoxy coatings shall be factory applied by an electrostatic or thermosetting process.

15230.2.1.4 GATE VALVES 16-INCHES AND LARGER - Gate valves 16-inches and larger shall be as follows:

- Valves shall be double-disc gate valves with flanged ends.
- Valves shall be manufactured in accordance with AWWA C-500. Bolts, nuts, studs, etc., used with the gear case also shall conform to the requirements for Bonnet Bolting in AWWA C-500.
- Valves shall have bevel gears and shall be actuated by 2-inch square operating nuts.
- The gears and stuffing box shall be enclosed in a watertight cast or ductile iron case for operation in buried location.
- The case shall be filled with grease at the factory.
- Valves shall be designed to operate in a horizontal orientation.
- Valves shall be equipped with bronze tracks, rollers and scrapers.
- By-pass valves shall be furnished with each valve mounted in position A as indicated in AWWA C-500.

15230.2.1.5 VALVES ON WATER MAINS - Valves on water mains shall have the following features:

- In-line valves shall have push-on or mechanical joints conforming to AWWA C-111.
- Valves attached to side outlets shall be flanged.
- By-pass valves shall be flanged.
- Valves in blow-off lines shall be flanged.
- Valves in fire hydrant lines shall have push-on or mechanical joints.
- Valves in air release and vacuum relief lines shall be flanged or threaded.

- Valves 12-inches and smaller shall be equipped with O-ring packing.

15230.2.2 BUTTERFLY VALVES

15230.2.2.1 MANUFACTURER - Butterfly valves shall be Dresser Industries "450", Allis-Chalmers "Streamseal", Henry Pratt "Groundhog", Mueller Lineseal III, or an approved equal.

15230.2.2.2 COMPLIANCE - Butterfly valves shall conform to AWWA C-504.

15230.2.2.3 CLASS - Valves shall be Class 150 seated, tight closing valves, furnished with mechanical or flanged joints

15230.2.2.4 SEATS - Rubber valve seats shall be replaceable without disassembling the valve and shall not be interrupted by the shafting. Rubber seats may be retained on the disc edge by stainless steel clamping in lieu of bonding to the valve body.

15230.2.2.5 SHAFT PACKING - Shaft packing shall be of the self-adjusting permanent type.

15230.2.2.6 OPERATION - Underground opening and closing shall be accomplished with permanently lubricated screw-type operators, totally enclosed and of watertight construction. Overload protection shall be incorporated into the operator allowing the application of 450 foot-pounds input torque at full-open and full-closed positions without damage to the operator or valve. A 2-inch square wrench nut and valve box shall be provided for operating the valve. Valves shall open counter clockwise unless indicated otherwise in the Special Provisions.

15230.2.3 BALL VALVES

15230.2.3.1 MANUFACTURER - Valves shall be produced by a manufacturer having at least five years experience in the manufacture of water works and valves.

15230.2.3.2 VALVES 4-INCHES AND LARGER - Ball valves, 4-inches and larger, shall be ductile iron or cast-steel body, double seated valves meeting the requirements of ANSI/AWWA C-507.

15230.2.3.3 SMALLER VALVES - Smaller valves shall be stainless steel, bronze, or iron bodied valves of the size, type and class shown on the Drawings.

15230.2.4 CHECK VALVES

15230.2.4.1 COMPLIANCE - Check valves shall be manufactured in accordance with ANSI/AWWA C-508.

15230.2.4.2 DESIGN - Check valves shall be of a clear waterway, swing-check type. They shall be designed to be mounted horizontally. They shall be fitted with flanged ends for easy servicing. They shall have an iron body and be bronze mounted.

15230.2.4.3 SEATING - Valves shall be provided with a metal to resilient material seating.

15230.2.5 HOSE BIBS

Hose bibs shall be 3/4-inch bronze or brass body, Watts Model SC-1, Red & White Model RW 301 or approved equal. All hose bibs shall have a tee handle.

15230.2.6 SAMPLE FAUCET

Sample faucet shall be a ½-inch chromed or brass body hose bib without hose connection threads.

15230.2.7 FIRE HYDRANTS

15230.2.7.1 COMPLIANCE - Fire hydrants shall conform to standard for dry barrel fire hydrants, AWWA C-502 and modifications herein specified.

15230.2.7.2 DESIGN - Hydrants shall be designed as follows:

- Hydrants shall be of the "compression" or "toggle joint" type with safety flange and safety stem coupling above the ground line so that they can be repaired without shutting off the water.
- Hydrants shall be of the dry top design with two or more "O" rings sealing the water from the operating mechanism.
- Hydrants shall be furnished with 5-inch minimum valve openings, one 4 1/2-inch NST pumper connection and two 2 1/2-inch hose connections.
- Hose nozzle threads, pump nozzle threads, operating nut and opening direction shall match existing hydrants in the system.
- Hydrant lengths shall be designed for the cover depth shown on the drawings plus the diameter of the main line pipe.

15230.2.7.3 PAINTING - The portion of the hydrant above the ground line shall be painted in accordance with the Owner's standards.

15230.2.8 OPERATING WRENCHES

Unless notified otherwise by the Engineer, the Contractor shall furnish two, T-handle, operating wrenches for each project incorporating valves with 2-inch, square-head, operating nuts.

15230.2.9 VALVE BOXES

Valve boxes shall be cast iron, two piece, and adjustable valve boxes. Valve boxes shall be of the slip joint screw type and be of sufficient length for the pipe burial depth required. The cast iron cover of the valve box shall have the word "water" stamped thereon.

15230.2.10 CONCRETE ENCLOSURES

Concrete enclosures for valves shall be precast and of the type, size and configuration shown on the Drawings and shall be fabricated in accordance with the requirements for precast concrete construction provided in Section 03500.

15230.3 CONSTRUCTION REQUIREMENTS

15230.3.1 SETTING VALVES AND VALVE BOXES

All valves shall be set and jointed to the pipe in the manner described for pipe laying and jointing in Section 02222 of these Specifications. Valves shall be oriented with the operating nut vertical. Valve boxes shall be centered and plumb over the operating nut and shall be set so that no shock or stress will be transmitted to the valve. Tops of the valve boxes shall be set flush with the ground surface, concrete collars, or street surfacing, unless otherwise shown on the Drawings.

15230.3.2 VALVE RESTRAINT

Restraint shall be installed on all valves connected with slip-on, gasketed, or O-ring joints (i.e., bell & spigot, mechanical, etc.) in accordance with these Specifications and as shown on the Drawings.

15230.3.3 CONNECTING TO EXISTING MAINS

15230.3.3.1 CONNECTION TO EXISTING WORK - All connections to existing water mains shall be made by the Contractor, unless otherwise provided in these Specifications. The Contractor shall provide labor and materials, including special fittings and restraint devices, required to make the required connections between existing lines and new lines.

15230.3.3.2 INTERRUPTION OF SERVICES - Where the connection of new work to old requires interruption of service, the Owner, Engineer and Contractor shall mutually agree upon a date for such connection which will allow ample time to assemble labor and materials and to notify all customers in accordance with Section 01510.

15230.3.4 FIRE HYDRANT INSTALLATION

15230.3.4.1 SETTING - All hydrants shall stand plumb use hand level with the pumper nozzle facing the street. The hydrant shall be set with the ground line at the location indicated by the hydrant manufacturer.

15230.3.4.2 DRAINAGE - Drainage shall be provided at the base of the hydrant by placing clean gravel under and around the base of the hydrant as shown on the Drawings.

15230.3.4.3 RESTRAINT - All hydrants shall be restrained by setting thrust blocks or mechanical restraint assemblies in accordance with the Drawings.

15230.3.4.4 AUXILIARY GATE VALVES - All fire hydrant assemblies shall include auxiliary gate valves positioned as shown on the Drawings.

15230.3.5 THRUST BLOCKS

Thrust blocks or joint restraints (Mega Lug) shall be formed to prevent coverage of the pipe joints in accordance with the details shown on the Drawings and as described in Section 03100 and 03050. All thrust blocks shall be set against undisturbed earth.

15230.4 METHOD OF MEASUREMENT

15230.4.1 VALVES

Excavation, foundation preparation, restraint devices, valve boxes, backfill, and other miscellaneous devices, materials, or equipment required for installation shall be considered part of and included in the measurement of all valves and valve assemblies.

15230.4.1.1 NUMERICAL COUNT - When valves are installed as separate items or assemblies, the measurement shall be determined by counting the number of each size and type (including any associated valve box and concrete valve box collar) of valve installed and accepted.

15230.4.1.2 LUMP SUM - When valves are located in an enclosure, measurement shall be made as lump sum for the enclosure assembly and shall include the valve, any supplemental valves and fittings in the enclosure, and the enclosure.

15230.4.2 HYDRANTS

Measurement of hydrants shall be made by counting the number of hydrants set and accepted. For each hydrant, this measurement shall include the tee, shut-off gate valve, excavation and backfill, drain gravel, valve box and concrete collar, restraint, hydrant, and 5-feet of pipeline extending from the tee on the main line to the hydrant.

15230.4.3 NO SEPARATE MEASUREMENT

No separate measurement will be made for thrust blocks or other restraint provided with valves and fittings. Neither will separate measurement be approved for sample faucets and hose bibbs. Measurement for these items will be included with the quantity of the assembly whereon they are installed.

15230.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price.

PAY ITEM	UNIT
(Size) Gate Valve	Each
(Size) Ball Valve	Each
(Size) Ball Valve	Each
(Size) Butterfly Valve	Each
(Size) Check Valve	Each
Fire Hydrant Assembly	Each

WASTEWATER VALVES — SECTION 15231SP

15231.1 DESCRIPTION

The CONTRACTOR shall furnish and install wastewater system valves as identified in this Section.

15231.1.1 SUBMITTALS

Descriptive literature which identifies the manufacturer, model numbers, materials of which the valves are fabricated, and their capacities shall be provided by the CONTRACTOR in accordance with Section 01300 of the STANDARD SPECIFICATIONS FOR CONSTRUCTION.

15231.2 MATERIALS

15231.2.1 PLUG VALVES

15231.2.1.1 All plug valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the DRAWINGS. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. Standard. Mechanical joint ends shall be to the AWWA Standard C111-64, grooved ends per AWWA C-606-87. Screwed ends shall be to the NPT standard.

15231.2.1.2 Valve bodies shall be of ASTM A126 Class B cast iron with 12 mils of blue epoxy on the interior with standard surface prep and 12 mils minimum of blue epoxy on the exterior with standard surface prep. Bodies in 4" and larger valves shall be furnished with a 1/8" welded overlay seat of not less than 90% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable.

15231.2.1.3 Plugs shall be of ASTM A126 Class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug shall be resilient faced with neoprene or hycar, suitable for use with sewage. Plug facing on power actuated valves shall be chloro-isobutane-isoprene.

15231.2.1.4 Valves shall have sleeve type metal bearings and shall be of sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CF-8M in ½"-36" sizes. In valves larger than 36", the upper and lower plug journals shall be fitted with ASTM A-240 type 316b stainless sleeves with bearings of ASTM B30, Alloy C95400 aluminum bronze. Non-metallic bearings shall not be acceptable.

15231.2.1.5 Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.

15231.2.1.6 Valve pressure ratings shall be 175 psi through 12" and 150 psi for 14" through 72". Each valve shall be given a hydrostatic and seat test with test results being certified when required by the specifications.

15231.2.1.7 Manual valves shall have lever or gear actuators and tee wrenches, extension stems, floor stands, etc., as indicated on the DRAWINGS. All valves 6" and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set

closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts and washers shall be zinc plated.

15231.2.1.8 Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washers shall be stainless steel.

15231.2.1.9 Power actuated valves shall be furnished with Flowserve Limitorque Series MX actuators. Valve actuators shall be equipped with a modulating 4-20 mA positioner and transmitter and shall be rated for 1200 maximum starts per hour. Actuator motors shall be rated for 460VAC/3PH/60HZ/TOL. Actuator worm gear operator shall be PTA-30/2/SG 3:5:1. Specification information for powered actuators was given by Great Western Valves & Automation in Salt Lake City, Utah. Equivalent equipment will be considered for approval.

15231.2.1.10 Actuators shall be equipped with an operating nut to allow manual valve operation in case of supply failure.

15231.2.1.11 All eccentric plug valves shall be either Series PEF (Standard Port) as manufactured by DeZURIK with AUMA EMO (electric motorized operator) or approved equal.

15231.2.2 BALL VALVES

15231.2.2.1 Ball valves, 4-inches and larger, shall be cast-steel, ductile iron, or bronze body, double seated valves. Valve body material shall be consistent and compatible with system piping and shall meet requirements of ANSI/AWWA C-507. Smaller ball valves shall be stainless steel, bronze or iron bodied valves of the size, type and class shown on the DRAWINGS.

15231.2.2.2 Ball valves to be used in instrumentation installations shall be stainless steel body, Whitey Series 60, Parker Swing-Out, or equal. Operating handles shall be oval pattern, to reduce handle interferences. Valve seats shall be reinforced TFE, and valve connections shall be female NPT.

15231.2.2.3 Certification of performance, leakage and hydrostatic tests, as described in Section 5 of ASTM/AWWA C-507, shall be furnished upon request to the ENGINEER. Valves shall be the products of a manufacturer having at least five years experience in the manufacture of water works and valves.

15231.2.3 CHECK VALVES

15231.2.3.1 Check valves shall be swing-check type, iron body, bronze mounted, with flanged ends, and manufactured in accordance with ANSI/AWWA C-508. Seating shall be provided with a resilient material to metal and the valve shall be of a clear waterway type.

GRIT LINE CHECK VALVE

Manufacturer/Model: Valmatic / Swingflex 504A (Design Basis)
Or approved equal.

Materials of Construction:

BODY:	DUCTILE IRON ASTM A536, GRADE 65-45-12 (SERIES 500A) CAST IRON ASTM A126, CLASS B (SERIES 500)
COVER:	DUCTILE IRON ASTM A536, GRADE 65-45-12 (SERIES 500A) CAST IRON ASTM A126, CLASS B (SERIES 500)
DISC:	BUNA-N W/ ALLOY STEEL & NYLON REINFORCEMENT BUNA-N ASTM D2000

15231.2.3.2 Check valves shall be mounted horizontally and all internals shall be replaceable in the field without removal of the valve body from the system. Unless noted otherwise, interior surfaces shall be coated with an epoxy coating conforming to ANSI/AWWA C-550.

15231.2.4 SEWAGE AIR RELEASE VALVE

15231.2.4.1 The sewage air release valve shall have an elongated body and be designed to operate (open) while pressurized, allowing entrained air in a sewage force main line, sewage pump, or waste water system to escape through the air release orifice. After entrained air escapes through the air release orifice, the valve orifice shall be closed by a needle mounted on compound lever mechanism, (energized by a float), to prevent sewage media from escaping. The air release orifice will then remain closed until more air accumulates, causing the opening cycle to repeat automatically. The internal compound lever mechanism shall be precision molded Delrin and other internals shall be stainless steel to positively prevent galvanic action.

15231.2.4.2 The lever mechanism shall be fitted with a rod, having a stainless steel float threaded onto the opposite end. The float shall hang inside of the valve body, slightly above the inlet, and 22 inches from the lever mechanism, thereby maintaining an air gap between the mechanism and the waste media. The air gap shall retard waste solids from clogging the lever mechanism. The valve body and float shall withstand 500-psi shell test pressure.

15231.2.4.3 The valve shall be furnished with a 2-inch inlet connection, and a ½-inch outlet. All connections to the valve shall be female NPT connections. In addition the valve shall be supplied with a 2-inch inlet shut off valve, a 1-inch blow off valve, a ½-inch back-flushing valve with quick disconnect hose connection and 25 feet of back-flushing hose. The ½-inch air release connection shall be left empty for field plumbing connection. The CONTRACTOR shall install plumbing piping to the air release valve in accordance with the project DRAWINGS.

15231.2.4.4 The valve body and cover shall be cast iron in accordance with ASTM A 48 Class 30. Internal linkage shall be bronze / delrin in accordance with ASTM B-548 / ASTM D 2133. The float and internals shall be stainless steel in accordance with ASTM A 240. The needle shall be Buna-N. Exterior paint shall be phenolic primer and red oxide. The sewage air release valve shall be a 2-inch APCO Series 400 Sewage Air Release Valve, as manufactured by Valve and Primer Corporation, Schaumburg Illinois, or approved equal.

15231.2.5 BUTTERFLY VALVES

Butterfly Valves – Resilient Seat:

1. NPS 2 to 24: Valve body shall be full lugged cast or ductile iron 175 psig body with a Nylon 11 coated, 316 Stainless Steel disc, EPDM seat, Carbon Steel stem, extended neck and shall meet ANSI 125/150 flange standards. Disc-to-stem connection shall utilize a double “D” or key design requiring no splines, screws or pins to connect stem to disc with no possible leak paths. The seat shall be molded in or tongue-and-groove with a primary hub seal and a molded O-ring or suitable for weld-neck and slip on flanges.

Manufacturer and Model:

Bray Series 30/31 or approved equal.

15231.2.6 BURIED VALVES AND VALVE BOXES

Valves to be buried shall be operated by means of a 2-inch square operating nut, and shall be furnished complete with a valve box and lid. Valve boxes shall be cast iron, two-piece, adjustable valve boxes. Valve boxes shall be of the screw type and of sufficient length for the pipe burial depth required. The cast iron cover of the valve box shall have the word "wastewater" stamped thereon.

15231.2.7 CONCRETE ENCLOSURES

Concrete enclosures for valves shall be precast and of the type, size and configuration shown on the DRAWINGS and shall be fabricated in accordance with the requirements for precast concrete construction provided in Section 03500.

15231.3 CONSTRUCTION REQUIREMENTS

15231.3.1 SETTING VALVES AND VALVE BOXES

15231.3.1.1 All valves shall be set and jointed to the pipe as described in these SPECIFICATIONS, Section 02222. Valves shall be installed with the orientation of operator being vertical, unless otherwise shown on the DRAWINGS.

15231.3.1.2 Valve boxes for underground valves shall be centered and plumb over the operating nut and shall be set so that no shock or stress will be transmitted to the valve. Tops of the valve boxes shall be set flush with the ground surface, concrete collars, or street surfacing, unless otherwise shown on the DRAWINGS.

15231.3.2 VALVE RESTRAINT

15231.3.2.1 Joint restraints shall be installed on all valves connected with O-ring joints (i.e., mechanical, bell & spigot, etc.) in accordance with these SPECIFICATIONS and as shown on the DRAWINGS.

15231.3.2.2 Thrust blocks, used to provide restraint to underground valves and components, shall be formed to prevent coverage of the pipe joints in accordance with the details shown on the DRAWINGS and Section 03100 and 03304. All thrust blocks shall be set on undisturbed earth.

15231.3.3 CONNECTING TO EXISTING SYSTEM

15231.3.3.1 The CONTRACTOR shall make all connections to an existing system, unless otherwise provided in these SPECIFICATIONS. The CONTRACTOR shall provide labor and materials, including special fittings, required to make these connections.

15231.3.3.2 Where the connection of new WORK to old requires interruption of service, the OWNER, ENGINEER and CONTRACTOR shall mutually agree upon a date for such connections which will allow ample time to assemble labor and materials, and to notify all customers in accordance with Section 01510 of these SPECIFICATIONS.

15231.4 METHOD OF MEASUREMENT

15231.4.1 Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

15231.4.2 Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured at the unit rates for each item listed.

15231.5 BASIS OF PAYMENT

15231.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

15231.5.2 When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Plug Valves (*Size*)	Each
Butterfly Valve (*Size*)	Each
Ball Valves (*Size*)	Each
Check Valve (*Size*)	Each
Valve (*Description*) Assembly	Each

15232.1 DESCRIPTION

This section covers furnishing and installing water system control valves, including: pressure release, pressure sustaining, pressure reducing, water level control, air relief, vacuum relief, deep well pump control, back flow prevention and surge control with their enclosures and miscellaneous support equipment.

15232.1.1 RELATED WORK

Section 02222 - Waterline Pipe Installation
Section 03050 - Portland Cement Concrete
Section 03100 - Concrete Forming, Finishing and Curing
Section 03200 - Concrete Reinforcement
Section 15110 - Pipe and Piping Systems
Section 15230 - Waterline Valves and Hydrants

15232.1.2 SUBMITTALS

15232.1.2.1 CERTIFICATION OF COMPLIANCE - Certification of compliance to the standards and Specifications contained herein shall be obtained from the manufacturer and provided by the Contractor at the time of delivery of these materials to the project site.

15232.1.2.2 DESCRIPTIVE LITERATURE - Descriptive literature which identifies the manufacturer, model numbers, materials of which the control valves are fabricated, and their capacities shall be provided by the Contractor in accordance with Section 01300 of these Contract Documents.

15232.1.2.3 OPERATION AND MAINTENANCE INSTRUCTIONS - Manufacturer's installation, operation and maintenance literature for each control valve shall be furnished to the Owner prior to the time of final acceptance for payment.

15232.1.3 DEFINITIONS

Not used.

15232.2 MATERIALS

15232.2.1 GENERAL

All control valves furnished and installed under this contract shall be of the model, size, and type shown on the Drawings or required in these Specifications. They shall have been produced by the same manufacturer and shall be provided by a supplier located in the state in which the installation is to be made. They shall be furnished with a manufacturer applied, NSF approved, fusion bonded, epoxy coating. Seats shall be designed so that they are easily maintained and without edges that induce cutting or wear at low flows. Unless otherwise required to meet specific service conditions, all cast iron or steel valves shall be 150 lb. Class.

15232.2.2 ALTITUDE CONTROL VALVES

Altitude control valves shall be as manufactured by CLA-VAL Company, or approved equal. Valves shall be of ductile iron flanged, spring loaded, 3-way, diaphragm actuated, globe pattern valves. Valve control shall be provided by a pressure difference sensor (and when called for on the Drawings or in these Specifications, fitted with a direct acting solenoid control) with appropriately sized piping and supports. Valves shall have a valve position indicator, cocks to isolate the pilot system and closing speed control. Four-inch and smaller valves shall be fitted with flow clean strainer while larger valves shall be provided with a "Y"-pattern strainer in the pilot control system.

15232.2.3 PRESSURE RELIEF/PRESSURE SUSTAINING VALVES

Shall be ductile iron, modulating, hydraulic operated, pilot controlled, flanged valves with globe pattern. All pressure sustaining valves shall be designed to maintain constant upstream pressure at the set point indicated on the Drawings or in the Special Provisions. Pressure sustaining valves shall be provided with a position indicator operated by a pressure difference sensor and shall have appropriately sized piping and supports. The pilot system shall be capable of being isolated with shut-off cocks, be fitted with a strainer, and shall be able to control closure to prevent surges.

15232.2.4 COMBINATION BACK PRESSURE/SOLENOID SHUTOFF VALVE

Shall be ductile iron, flanged, globe pattern, modulating hydraulic operated, pilot controlled, with solenoid activated shut-off. The valve shall open sufficiently to maintain a pre-set inlet (back) pressure. When the inlet pressure is less than the control setting, the pilot system shall close the valve tight. The pilot system shall be capable of being isolated with shut-off cocks, be fitted with a strainer and shall be able to control closure to prevent surges.

15232.2.5 PRESSURE REDUCING VALVES

Shall be modulating pressure reducing with globe pattern. Valves shall be provided with pilot control which operates such that positive and gradual closure can occur to prevent any surge or line shock. Pressure reducing valves shall be equipped with a valve position indicator, cocks to isolate the pilot system, speed for control of closure and a strainer on the pilot system inlet.

15232.2.6 BACK-FLOW PREVENTION VALVES

Shall be an assembly of double independently acting, spring-loaded toggle lever check valves with two shut-off valves which meet the requirements of ANSI/AWWA C-506. Valve body and cover shall be of bronze. Valves shall be fitted with stainless steel springs and with molded synthetic rubber clapper, poppet and facing rings.

15232.2.7 AIR/VACUUM RELIEF VALVES

Shall be simple lever type, kinetic combination air valves, with cast iron body and stainless steel floats. Vents for air/vacuum relief valves shall be threaded GI pipe and shall be protected with fittings covered with No. 14 stainless steel, bronze or aluminum screen.

15232.2.8 DEEP WELL SOLENOID PUMP CONTROL VALVE

Shall be globe pattern, hydraulically operated diaphragm valve controlled by a solenoid pilot valve. The pilot system shall have separate adjustable flow control valves, a "Y" strainer, and shall be fitted with cocks to enable isolation during servicing. The valve stem shall have a limit switch to serve as an electrical interlock between the valve and pump motor.

15232.2.9 ENCLOSURES

Enclosures for control valves shall be concrete, furnished and installed in accordance with the Drawings and the requirements of Sections 03100, 03200, and 03050 of these Specifications.

15232.2.10 MISCELLANEOUS PIPE, FITTINGS, VALVES AND EQUIPMENT

Miscellaneous pipe, fittings, valves and equipment needed to assemble and support operation of the control valves shall be as shown on the Drawings and in conformance with Sections 02222, 15110, and 15230 of these Specifications.

15232.3 CONSTRUCTION REQUIREMENTS

Prior to installing control valves, the Contractor shall flush, blowout, or otherwise clean all dirt and debris from connecting lines. Control valves shall be installed with appropriate supporting piping and equipment in accordance with manufacturer's recommendations. Control valves shall be fitted with flanged connections or installed in a manner which will allow easy removal in the enclosure or area wherein the valves are installed. As soon as control valves are pressurized (placed in service), the Contractor shall check and adjust, if necessary, all valve assemblies to assure they are adjusted correctly and functioning as designed.

15232.4 METHOD OF MEASUREMENT

15232.4.1 NO MEASUREMENT

Measurement will not be made for control valves that are installed as part of a structure or assembly identified as a separate line item in the Bid Schedule. In such cases, valves and their installation will be included in the lump sum quantity represented for that structure.

15232.4.2 SEPARATE MEASUREMENT

When valves are identified as individual line items on the Bid Schedule, quantities shall be measured by counting the numbers of each type of valve in place and accepted. In such cases, measurement will include all valves, couplings, enclosures, manhole covers, excavating and footings required and other necessary equipment and materials required to complete the assembly as shown on the Drawings.

15232.5 BASIS OF PAYMENT

The accepted quantity will be paid for at the contract unit price:

PAY ITEM	UNIT
Altitude Valve (size, type)	Each
Float Valve (size, type)	Each
Pressure Relief Valve (size, type)	Each
Pressure Sustaining Valve (size, type)	Each
Pressure Reducing Valve (size, type)	Each
Pressure Reducing Valve (size, type)	Each
Back Pressure Valve (size, type)	Each
Backflow Prevention Valve (size, type)	Each
Air Release Valve (size, type)	Each
Vacuum Relief Valve (size, type)	Each
Air/Vacuum Relief Valve (size, type)	Each
Combination Air/Vacuum Valve (size, type)	Each
Sewage Air Relief Valve (size, type)	Each
(Type)Valve Assembly	Each

ELECTRIC ACTUATED BUTTERFLY VALVES — SECTION 15232SP

15232.1 DESCRIPTION

The CONTRACTOR shall furnish and install valves as identified in this Section.

15232.1.1 SUBMITTALS

Descriptive literature which identifies the manufacturer, model numbers, materials of which the valves are fabricated, and their capacities shall be provided by the CONTRACTOR in accordance with Section 01300 of the STANDARD SPECIFICATIONS FOR CONSTRUCTION.

15232.2 MATERIALS

15232.2.1 BUTTERFLY VALVES

15232.2.1.1 All air line butterfly valves size 2" through 12" shall be resilient seated Keystone butterfly valves as manufactured by Tyco Flow Control, or approved equal. The valve shall be capable of bi-directional, drop-tight service to 250 psig [16 bar] and vacuum.

Valve body shall be wafer style and meet ANSI Class 125/150 flange standards. Valve neck length shall be sufficient to allow for flange clearance and piping insulation.

Valve body shall have an integrally cast top plate for direct flush-mounting of manual or power actuators without use of brackets or adaptors.

15232.2.2 SEAT - The seat shall be molded in and ensure drop-tight, bi-directional shutoff. The seat shall fully isolate the valve body, stem and journal areas from the flowing media. A molded in O-ring shall be used on the flange face to eliminate the need for flange gaskets.

15232.2.3 DISC - The disc edges and hubs shall be hand polished to reduce frictional torque. The disc and stem shall be connected by a torque plug, which shall provide positive engagement, preventing blowout of the one piece stem. The torque plug shall maintain a leak-proof and shake-proof connection and allow for quick, easy disassembly. Loose or slip fit connections between disc and stem are not allowed.

15232.2.4 BEARINGS & STEM PACKING - The valve shall have upper and lower bronze inboard stem bearings, isolated from the line medium, and a heavy-duty upper stem bushing. Bi-directional stem packing shall be made of NBR and shall ensure a dry stem design.

15232.2.5 MATERIALS OF CONSTRUCTION

Body: Cast Iron ASTM 126 Class B
Seat: EPDM NBR
Disc: Aluminum-Bronze Stainless Steel
Stem: Carbon Steel
Upper Stem Bushing: Acetal
Inboard Stem Bearings: Bronze
Stem Packing: NBR
Torque Plug Disc-Stem Connection: 316 Stainless Steel

15232.2.2 ELECTRIC ACTUATOR

15232.2.2.1 Where called for in the Drawings, butterfly valves shall be fitted with Keystone electric actuators as manufactured by Tyco Flow Control, or approved equal. The actuator shall have a hand wheel for manual operation.

15232.3 CONSTRUCTION REQUIREMENTS

15232.3.1 The CONTRACTOR shall install all items and components under this section in accordance with the manufacturer's installation instructions, the DRAWINGS and these SPECIFICATIONS. Where instructions are unavailable or unnecessary, the CONTRACTOR shall at all times use good workmanship practices, applicable building codes, and regulations. The CONTRACTOR shall supply and install all miscellaneous fittings required to provide a complete operating system or component as applicable.

15232.4 METHOD OF MEASUREMENT

15232.4.1 Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

15232.4.2 Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured at the unit rates for each item listed.

15232.5 BASIS OF PAYMENT

15232.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

15232.5.2 When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	**UNIT**
Electric Actuated Butterfly Valve (*Size*)	Each

15234.1 DESCRIPTION

Includes furnishing and installing materials which include excavation, water main tapping, stops, valves, service lines, meters, settings, boxes and other accessories required for installing water services to system users.

15234.1.1 RELATED WORK

Section 02200 - Trench Excavation and Backfill
Section 02222 - Waterline Pipe Installation
Section 15110 – Pipe and Piping Systems

15234.1.2 SUBMITTALS

15234.1.2.1 DESCRIPTIVE LITERATURE - Descriptive literature which identifies the manufacturer, model, size, material and parts lists from which the piping, fittings, valves and meters are manufactured, including installation instructions, shall be provided to the Engineer in accordance with Section 01300.

15234.1.2.2 CERTIFICATION OF COMPLIANCE - Written certification of compliance from the respective manufacturer shall be provided with each delivery of metal fittings, valves and meters.

15234.1.3 DEFINITIONS

Mains - Water distribution pipes, located in streets or rights-of-ways, to which water service connections are made for users of the system.

Tap - The actual connection made to water mains which includes drilling an opening into the main, threading, installing a tapping saddle when appropriate, and inserting (screwing) a valve into the opening.

Saddle - A fitting placed on a pipe to reinforce the pipe wall through which the tapping hole is drilled.

Key - Can mean either: the center piece of a corporation or curb valve which is turned to control flow through the valve; or, the "T-shaped" tool used by operators to reach and turn the key or closing piece of a valve.

Setter (also referred to as "yoke") - Is the prefabricated assembly of pipes and valves installed in a meter box and connected into the service line in which the water meter is mounted (or "set").

15234.2 MATERIALS

15234.2.1 SADDLES

Saddles shall be copper alloy body with copper alloy or stainless steel straps designed and sized specifically for tapping PVC water mains. Threading shall be tapered and the saddle shall conform to ANSI/AWWA C-800. Straps shall provide full support around the circumference of the pipe and have a bearing area of sufficient width along the pipe axis so that the pipe will not be distorted when tightened.

15234.2.2 CORPORATION STOPS

Corporation stops shall be copper alloy body ball-type or balanced pressure, o-ring sealed plug type valves with tapered threads and in conformance with the requirements of ANSI/AWWA C-800.

15234.2.3 CURB VALVES

Curb valves shall be copper alloy body ball-type valves; or balanced pressure, o-ring sealed, plug type valves. Curb valves shall be furnished with cast iron curb boxes and one piece lids fitted with copper alloy pentagon plug. The curb box shall be sized to properly fit the valve and adjust to the depth to which the valve is set.

15234.2.4 SERVICE LATERAL PIPE

Service lateral pipe shall be as called for on the Drawings and in accordance with the following:

15234.2.4.1 COPPER SERVICE PIPE - Copper service pipe shall be Type K soft, conforming to Federal specification WW-T-799 or ASTM B88-62.

15234.2.4.2 POLYETHYLENE PIPE - Polyethylene service pipe shall conform to the requirements of AWWA C-901, "Polyethylene (PE) Pressure Pipe, Tubing and Fittings, 2-inch through 3-inch for water." PE Pipe shall be pressure tubing conforming to Table 6 of said specification. Tubing shall be Class 160 with a DR of 9.0 or Class 200 with a DR of 7.3. If not specified, DR 7.3 shall be used.

15234.2.4.3 Ends of polyethylene tubing inserted in compression connections should be fitted with insert reinforcement.

15234.2.5 METER SETTER (YOKE)

Meter setter shall be fit with copper tubing (when required) and copper alloy and copper alloy fittings. Setters shall be furnished with copper alloy body, angle or straight, ball-type inlet valves with fittings appropriately sized to fit the meter. When required, a cast iron yoke ban shall be furnished to provide the setting.

15234.2.6 CHECK VALVE

Unless indicated otherwise on the Drawings, a check valve shall be provided with each meter setting. Check valves shall be copper alloy bodied, dual valves which meet the requirements of the State and local health authorities and conform to ASTM/AWWA C-510.

15234.2.7 WATER METERS

Water meters shall be cold water displacement type meters which complies with ANSI/AWWA C-700. The main case and bottom plate shall be of bronze and the meter shall be sized and equipped as shown on the Drawings. The meters shall be Model SR II by SENSUS Technologies, PMM Multi-Jet Series by Precision Meters, or an approved equal.

15234.2.8 METER BOX

Meter boxes shall be fabricated from rigid PVC or ABS plastic pipe. They shall have a minimum diameter of 18-inches, be sized to fit over the meter assembly while allowing reasonable interior access, and shall make an appropriate fit with the meter box ring and cover.

15234.2.9 METER BOX RING AND COVER

The meter box ring and cover shall be cast iron with a minimum diameter of 18-inches but shall be appropriately sized to fit larger meter boxes where required. The words "WATER METER" shall be cast into the cover. The cover shall be a locking type with a pentagonal head, corrosion resistant, screw down, locking device.

15234.2.10 METER BOX DRAINAGE

Meter box drainage shall be provided by placing 3-cubic yards of drain gravel at the base of new meter box drain.

15234.3 CONSTRUCTION REQUIREMENTS

15234.3.1 TRENCHING AND BACKFILL

Trenching and backfill for installation of service connections shall be completed in accordance with Section 02200. Service lines shall have a minimum of 3.5-feet of cover.

15234.3.2 INSTALLATION OF CONNECTIONS

Installation of water service connection components shall be as shown on the Drawings. All connections to PVC pipe shall be made by using a saddle rather than a direct tap. Service lines shall be slightly snaked in the trench near the connection to the water main to allow for some movement to avoid a rigid connection.

15234.3.3 REPLACEMENT OF EXISTING FACILITIES

When replacement of specified components of service connections is required, the Contractor shall: protect existing equipment, provide appropriate connecting fittings to accommodate the new component, use care in removal and salvaging of the existing component and deliver the existing components to the Owner's maintenance shop or headquarters.

15234.4 METHOD OF MEASUREMENT

15234.4.1 CONNECTIONS

Measurement for service connections shall be made by counting the number of "each" size of connection (consisting of furnishing and installing: (1) service saddle on the water main; (2) drilling and tapping; (3) corporation stop; and (4) the necessary excavation and backfilling) installed and accepted.

15234.4.2 SERVICE LATERALS

Service laterals shall be measured using an accurate measuring device to determine the number of linear feet of each size of service lateral pipe installed between the corporation stop and the meter setter. This measurement shall include furnishing and installing the pipe and appropriate connecting fittings and any necessary trench excavation and backfilling.

15234.4.3 SERVICE METER SETTER ASSEMBLY

Measurement of service meter setter assemblies shall be made by counting the number of each size of assembly furnished, installed, and accepted. This measurement shall include the curb stop meter

setter, connecting fittings, meter box, lid, drain gravel, and the necessary excavation and backfilling.

15234.4.4 WATER METERS

Measurement of water meters shall be made by counting the number of meters of each size furnished, installed, and accepted.

15234.4.5 STOCK WATERING TAPS

Measurement for stock watering taps shall be made by counting the number of each size of connection installed and accepted. This measurement shall include furnishing and installing: (1) service saddle on the water main; (2) drilling and tapping; (3) corporation stop; (4) 20-feet of service lateral; (5) curb stop and box; and (6) the necessary excavation and backfilling required to complete the connection.

15234.4.5 REPLACEMENT OF EXISTING FACILITIES

Where certain components of a total existing water service connection are to be replaced, measurement will be made by counting the number of each size and/or kind of the specifically identified component or components as shown in the Bid Schedule as installed and accepted. Such measurement shall include furnishing and installing the identified component, necessary excavation and backfill, and salvaging and delivery of any replaced component when designated.

15234.5 BASIS OF PAYMENT

The accepted quantities shall be paid for at the contract unit price for:

PAY ITEM	UNIT
(*Size*) Service Connection	Each
(*Size*) Service Lateral	Linear Foot
(*Size*) Service Meter Assembly	Each
(*Size*) Meter	Each
Replace (*Size*) (*Component Name*)	Each
Install (*Size)(Component Name*)	Each
(*Size*) Stock Watering Tap	Each
(*Size*) Stock Watering Tap	Each

TROY VALVE
A DIVISION OF PENN-TROY MANUFACTURING INC.
MANUFACTURING TRUST.

Toll Free: 800-232-4442
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SECTION 15235SP

FLOOR PRESSURE RELIEF VALVES

1.0 GENERAL CONDITIONS

1.1 SCOPE OF WORK

A. The contractor shall furnish all labor, materials, equipment and incidentals required for installation of floor pressure relief valves.

1.2 QUALITY ASSURANCE

A. The manufacturer shall have 10 years' experience manufacturing floor pressure relief valves and shall show evidence of satisfactory operation in at least 5 installations. The manufacturer shall be ISO 9001 certified.

1.3 SUBMITTALS

A. The manufacturer shall submit drawings showing critical dimensions, general construction, and materials used in the valve.

2.0 PRODUCT

2.1 GENERAL DESIGN FOR MODEL A2550

A. The relief valve shall have a cast iron body, cover, and removable grate.

B. The cover shall have a resilient seat which mates with a machined bronze surface for sealing. Rubber-to-rubber seals shall not be accepted.

C. The body of the valve shall have an integrally cast water stop to prevent water from traveling around the outside of the wall pipe.

D. Valves shall be supplied to the exact length required to avoid field cutting. Additional length shall be acquired by adding PVC pipe to the bottom of the valve.

E. The valve shall be machined, assembled, and tested in the USA for quality assurance.

F. The manufacturer shall show proof of ISO 9001 certification.

G. Where required, the manufacturer shall provide valve operating stems, floor stands, and stem guides as specified in the valve schedule or plans.

H. Valve shall be Troy Valve Model A2550 4" or 6", or equal.

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SECTION 15235SP

STAINLESS STEEL WALL PRESSURE RELIEF VALVES

1.0 GENERAL CONDITIONS

1.1 SCOPE OF WORK

A. The contractor shall furnish all labor, materials, equipment and incidentals required for installation of stainless steel wall pressure relief valves.

1.2 QUALITY ASSURANCE

A. The manufacturer shall have 10 years' experience manufacturing wall pressure relief valves and shall show evidence of satisfactory operation in at least 5 installations. The company shall be ISO 9001 certified.

1.3 SUBMITTALS

A. The manufacturer shall submit drawings showing critical dimensions, general construction, and materials used in the valve.

2.0 PRODUCT

2.1 GENERAL DESIGN FOR MODEL A2580

A. The relief valve shall have a 316-stainless steel body, cover, and removable grate.

B. The cover shall have a resilient seat which mates with a machined stainless-steel surface for sealing. Rubber-to-rubber seals shall not be accepted.

C. The body of the wall pipe shall have an integrally cast water stop to prevent water from traveling around the outside of the wall pipe.

D. Wall pipes shall be supplied to the exact length required to avoid field cutting. Additional length shall be acquired by adding PVC pipe to the bottom of the valve.

E. The valve shall be machined, assembled, and tested in the USA for quality assurance.

F. The manufacturer shall show proof of ISO 9001 certification.

G. Valve shall be Troy Valve Model A2580, 4" or 6", or equal.

15236.1 DESCRIPTION

Includes furnishing and installing tubular flanged water flow meter(s) of the size and type and location shown on the Drawings and as described in these Specifications.

15236.1.1 RELATED WORK

Section 02222 - Pipe Installation

15236.1.2 SUBMITTALS

The Contractor shall provide complete information which includes cutaway drawings, parts lists, and manufacturer's installation instructions in accordance with the requirements of Section 01300.

15236.1.3 DEFINITIONS

Not used.

15236.2 MATERIALS

15236.2.1 PERFORMANCE CAPABILITY

Flow meters shall be able to accurately operate in working pressures up to 150 PSI, at temperatures up to 140 degrees F. and for flows 40 GPM and greater. Meter sizes and measuring capacity shall be as shown on the Drawings. The meter's flow indicator shall be mechanically driven with a 3.5-inch (minimum) dial that provides a flow reading and totalizer reading up to six digits in GPM and total gallons. Meters installed in systems or at locations which are controlled by an electronic telemetry system shall be furnished with flow transmitters which can be connected into that system to indicate flow conditions.

15236.2.2 FABRICATION

Flow meters shall be manufactured to meet the requirements of ANSI/AWWA C-704 with a steel meter tube fitted with straightening vanes, all of which is coated with a fusion epoxy resin. Interior components of the meter shall be fabricated from stainless steel, plastic or other corrosion resistant materials which will provide long service. The propeller shall be magnetically connected to the drive mechanism and mounted with bearings which provide smooth operation for flows in both directions. The gearbox shall be cast bronze and the meter head shall be fabricated from cast iron or epoxy coated steel.

15236.3 CONSTRUCTION REQUIREMENTS

Flow meters shall be installed in accordance with the manufacturer's recommendations and consistent with the Drawings. The Contractor shall provide all materials and installation labor to assure proper installation and calibration of the meter(s) required.

15236.4 METHOD OF MEASUREMENT

15236.4.1 NO MEASUREMENT

Separate measurement will not be made for flow meters when installed as a component of a building, enclosure or assembly for which measurement is indicated in the Bid Schedule.

15236.4.2 SEPARATE MEASUREMENT

Separate measurement may be made for meters furnished and installed when so identified in the Bid Schedule. Measurement shall be made by counting the number of each size and type of valve installed and accepted.

15236.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price for:

PAY ITEM	UNIT
(*Size*) Flow Meter	Each

15238.1 DESCRIPTION

Includes furnishing and installing pressure gauges and their support piping and fittings in buildings and other structures at locations shown on the Drawings.

15238.1.1 RELATED WORK

Section 02222 – Waterline Pipe Installation
Section 15110 – Pipe and Piping Systems

15238.1.2 SUBMITTALS

The Contractor shall provide descriptive information which indicates the model number, manufacturer's name, dimensions, measuring range and manufacturer's certification of performance in accordance with the requirements of Section 01300.

15238.1.3 DEFINITIONS

Not used.

15238.2 MATERIALS

15238.2.1 PRESSURE GAUGES

Shall be US Gauge, Model 550L, stem mounted and oil filled, as manufactured by AMETEK or an approved equal. Gauges have a 2 1/2-inch (minimum) stainless steel case with a pressure relief plug. The window shall be polycarbonate plastic with neoprene sealing gasket. The pressure reading range shall be as shown on the Drawings or as prescribed in the Special Provisions.

15238.2.2 SUPPORTING PIPE AND FITTINGS

Shall be 1/4-inch threaded Schedule 40 galvanized pipe.

15238.3 CONSTRUCTION REQUIREMENTS

Pressure gauges shall be installed in accordance with the manufacturer's recommendations and at the locations shown on the Drawings. The Contractor shall provide sufficient supporting pipe to mount pressure gauges vertically and oriented to be read easily. When possible, pressure gauges should be installed at least three pipe diameters downstream from any valve in the pipeline.

15238.4 METHOD OF MEASUREMENT

Separate measurement of pressure gauges and their supporting piping will not be made. Measurement will be included with the building or structure that it serves.

15238.5 BASIS OF PAYMENT

Separate payment for pressure gauges will not be made.

Aqua-Aerobic Systems, Inc.
Specification for Floating Weir
For
Mountain Green WWTP, UT
Project ID# 116236A/Design #168304

SYSTEM SOURCE & QUALITY ASSURANCE

The Floating Weir System shall be supplied by a company of good reputation that is regularly engaged in the manufacture and fabrication of Floating Weir wastewater treatment systems. The manufacturer's experience shall include a minimum of ten (10) installations where equipment of similar size and design has been in operation successfully in a similar process for a minimum of ten (10) years.

The Contractor shall assign full responsibility for the functional operation of all Floating Weir System components to a Single Source Supplier. This Supplier shall be responsible for all engineering necessary in order to select, furnish, inspect the installing contractor's equipment installation and connections, calibrate, and place into operation the Floating Weir System along with all other equipment and accessories as specified herein.

SYSTEM OPERATION AND MAINTENANCE MANUALS

Complete system Operation and Maintenance manuals shall be available in hardcopy and electronic form. The electronic form shall be provided in .pdf format and be fully bookmarked. Manuals shall address:

- General project information
- Installation and start-up
- Process design and operational control description
- Mechanical components descriptions
- Maintenance and troubleshooting
- Mechanical drawings

INSTALLATION

The installation of the equipment furnished by the manufacturer shall be the responsibility of the installing contractor in accordance with all requirements of the contract documents.

SPECIFICATION PRECEDENCE

The specifications for equipment and controls under this section supersede specifications for equipment and controls specified elsewhere in the contract documents and drawings. Purchased components such as gear reducers, pumps, motors, valves, and actuators shall be provided with standard recommended manufacturers paint, unless otherwise specified within this section.

ACCEPTABLE MANUFACTURERS

These specifications and accompanying drawings are based upon the use of the Floating Weir System manufactured by Aqua-Aerobic Systems, Inc., 6306 North Alpine Road, Loves Park, IL, 61111, phone no. 815/654-2501, fax no. 815/654-2508.

SERVICE

The equipment manufacturer shall furnish the services of a factory trained representative for a maximum of one trip and one eight-hour days at the jobsite to inspect the installing contractor's equipment installation, supervise the initial operation of the equipment, instruct the plant operating personnel in proper operation and maintenance, and provide process assistance.

If additional service is required due to the mechanisms not being fully operational, at the time of service requested by the contractor, the additional service days will be at the contractor's expense.

The selected manufacturer shall have a free troubleshooting help line available 24 hours a day, 365 days per year for the life of the plant. The line shall connect to a live service technician who shall have the capability to coordinate remote access to the plant control system for diagnostics and support. Remote diagnostics will require permission of plant operations' staff.

WARRANTY

The Manufacturer shall provide a written warranty against defects in materials and workmanship. Manufacturer shall warrant the goods provided by the Manufacturer to be free from defects in materials and workmanship under normal conditions and use for a period of one (1) year from the date the goods are put into service, or eighteen (18) months from shipment of equipment, whichever first shall occur. This warranty shall not apply to any goods or part which has been altered, applied, operated or installed contrary to the Manufacturer's instructions or subject to misuse, chemical attack/degradation, negligence or accident.

FLOATING WEIR FUNCTIONAL REQUIREMENT

The manufacturer of the Floating Weir system shall be completely responsible for the proper design of their system, including but not limited to the floating weir. All equipment shall perform as specified and the completed installation shall operate in accordance with the requirements of the plans and specifications.

Any supplier wishing to bid other than the specified supplier shall provide the following:

A letter signed by an officer of the company certifying compliance with the specifications without exception. In addition, the supplier must certify the proposed motors will be Warranted by the motor supplier as outlined in the specified Warranty.

A field test report documenting the proposed or similar units have been field tested.

Proof of manufacturing and testing facilities.

Installation list with contacts and phone numbers for a minimum of ten installations of similar size in operation for ten years.

FAILURE FOR THE CONTRACTOR TO SUPPLY THIS INFORMATION WITH THE BID MAY BE CAUSE FOR DISQUALIFICATION OF THE CONTRACTORS BID.

The jobsite conditions are:

a) 1.5 MGD Avg. daily flow
MGD Maximum daily flow

b) Wastewater temperature 50°F to 68 °F

c) Jobsite elevation 4,915 feet MSL

d) Ambient air temperature 30 °F to 85 °F

AEROBIC DIGESTER/SLUDGE HOLDING BASIN STRUCTURE

The Aerobic Digester/Sludge Holding basin shall be field erected in two (2) basin(s) as shown on the contract drawings:

Inside Dimensions: 39.3 ft. x 50 ft.

Side Water Depth:
Maximum Operating Level: 16 ft. SWD
Top of Wall: 18 ft.

Provisions for valve access shall be provided by the installing contractor.

FLOATING WEIR
Furnish two floating weir(s) and related equipment accessories as described herein for each basin. Each floating weir shall consist of an integral flotation unit and a stainless steel weir assembly.

PERFORMANCE
Each floating weir shall be capable of withdrawing decant fluid from 4-6 inches beneath the liquid surface, regardless of liquid depth, down to the minimum allowable water level specified below. The decant liquid shall be drawn through an adjustable weir opening of 2-6 inches. The weir shall be circular in shape and permit liquid to enter the weir from the entire 360 degrees without obstruction.

Maximum allowable water level in the basin is 16 ft.
Minimum allowable water level in the basin is 14 ft.
The centerline of each discharge pipe must be located 3 ft. below the low water level by the installing contractor.

Each floating weir shall be rated for an average flow of 163.1 gallons per minute.

WEIR
The weir shall be constructed of 304 stainless steel, be circular in shape, and shall include vortex control baffles permanently affixed to the weir.

FLOATATION
Each unit shall be equipped with a modular float constructed of fiberglass filled with closed cell polyurethane foam having a minimum 2.0 lbs./ft3 density. Float shall be completely sealed to prevent the foam from being in contact with the external environment. Float shall have 995 lbs. reserve buoyancy to ensure stability and to provide support flotation required during servicing.

DISCHARGE HOSE
Each floating weir shall include a 4" diameter discharge hose of sufficient size to permit vertical movement of the floating weir and provide sufficient capacity to handle the design decant flow rate. Discharge hose shall be a EPDM tube, tire chord braided with helix wire reinforcement. A painted cast iron 304 stainless steel 90 degree elbow shall be provided for attachment to the through-the-wall pipe and decant hose. Through-the-wall pipe shall be provided by the installing contractor. Proper flanged connections to the floating weir and the discharge points shall be provided for trouble-free operation while permitting a means for disconnecting for service.

RESTRAINED MOORING SYSTEM
Furnished as part of the floating weir assembly shall be a galvanized steel mooring frame which shall permit the assembly to move up and down following the change in liquid level while restrained within the vertical pylons.

Each floating weir shall be moored with a restrained mooring system consisting of two- 4" diameter Schedule 40 vertical pylons with base plate constructed of galvanized steel. Each pylon with base plate shall be affixed to the basin floor with 304 stainless steel adhesive anchors. Each pylon shall be filled with concrete by the installing contractor.

All piping, (supports,) gaskets, and hardware beyond the terminating flange of the discharge pipe flexible joint shall be supplied by the installing contractor.

FLOATING WEIR MANUALLY OPERATED PLUG VALVE
Furnish one (1) 4” diameter manually operated plug valve per basin to control the decant rate.

Valve shall be a 4" diameter Milliken 601-N0-AG, 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM coated ductile iron plug. The valve shall be a non-lubricated type with a port area of at least 80% of full pipe size.

SPECIAL PROVISION

YARD HYDRANTS	SECTION 15241SP

15241.1 CONSTRUCTION REQUIREMENTS

15241.1.1 The 1" spigot assembly shall be constructed according to the Drawings and these Specification.

15241.1.2 The CONTRACTOR shall install all items and components under this section in accordance with the manufacturer's installation instructions, the DRAWINGS, and these SPECIFICATIONS. Where instructions are unavailable or unnecessary, the CONTRACTOR shall at all times use good workmanship practices, applicable building codes, fire codes, and regulations. The CONTRACTOR shall supply and install all miscellaneous fittings required to provide a complete operating system or component as applicable.

15241.2 METHOD OF MEASUREMENT

15241.2.1 The 1" spigot assembly shall be measured individually and includes the frost-free hose valve and assembly, 3/4" water supply line, connection to 3" non-potable watermain, and any other appurtenances required to provide a finished, working product.

15241.4.2 Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

15241.4.3 Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured by counting the total number of units installed, complete and accepted.

15241.5 BASIS OF PAYMENT

15241.5.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work.

15241.5.2 When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
1" Spigot Assembly (Includes spray nozzle, hose rack and hose)	Each

15300.1 DESCRIPTION

The Contractor shall furnish and install floor drains in structures of the size and type, and at the locations shown on the Drawings.

15300.1.1 RELATED WORK

Section 02222 – Waterline Pipe Installation
Section 02105 - Earthwork Materials

15300.1.2 SUBMITTALS

Not used.

15300.1.3 DEFINITIONS

Not used.

15300.2 MATERIALS

15300.2.1 DRAIN

Floor Drains shall be cast iron body, 6-inch (minimum) diameter heavy-duty grated type with a removable cast iron or stainless steel cover.

15300.2.2 PIPING

Drain piping shall be drain waste and vent (DWV) schedule 40 PVC pipe and fittings sized to fit the floor drain in accordance with the Drawings.

15300.2.3 P-TRAPS

P-traps, when required on the Drawings, shall meet the requirements of Schedule 40 PVC pipefittings sized to fit the drainpipe.

15300.2.4 DRAIN GRAVEL

Drain gravel for floor drain sumps, where applicable, shall meet requirements of Section 02105 and shall be installed as shown on the Drawings.

15300.2.5 CHECK VALVES

Floor drain check valve, when required by the Drawings, shall be a rubber slip-on check valve capable of draining drainpipe under low flows and low pressures. The valves shall require no maintenance or repair. The check valves shall be attached to the drainpipe by stainless steel clamps.

15300.3 CONSTRUCTION REQUIREMENTS

15300.3.1 SETTING DRAINS

Where floor drains are required, the floor will have been designed with a slope to a low point where the drain is to be placed. Typically, the floor drain will be cast in the low point in the floor at the time of installation of the floor. The Contractor shall take care to coordinate the setting of

the drain and the pouring of the concrete so that the top surface of the drain cover is flush with the floor surface to allow complete drainage of any water which accumulates on the floor.

15300.3.2 PIPE WORK

Piping shall be connected and run on a 1% minimum slope away from the drain as shown on the Drawings. Where termination of the piping is in drain gravel, care shall be taken to locate the pipe end in the top one-third of the gravel sump. Where termination of the piping is at daylight, the Contractor shall provide a 5-foot section of cast iron or ductile iron pipe, sized to match the drain pipe, at the daylight end of the pipeline so that the thermoplastic pipe will not be exposed to daylight.

15300.4 METHOD OF MEASUREMENT

15300.4.1 NO MEASUREMENT

Unless provided for as a separate bid item in the Bid Schedule, no separate measurement of the floor drain, its connecting piping, gravel sump, etc., will be made. Measurement of the drain will be included with the building or structure identified in the Bid Schedule.

15300.4.2 SEPARATE MEASUREMENT

When provided for in the Bid Schedule, the cost of all material and labor required of the floor drain assembly will be measured by counting the number of floor drain assemblies installed and accepted.

15300.5 BASIS OF PAYMENT

When a separate bid item is provided, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Floor Drain Assembly	Lump Sum
Floor Drain Assembly	Each

SPECIAL PROVISION

LINK SEAL	SECTION 15350SP

15350.1 DESCRIPTION

The Contractor shall furnish and install a complete Link Seal assembly, manufactured by the Thunderline Corporation, 8707 Samuel Barton Drive, Belleville, MI 48111, 800-288-0404, or approved equal.

15350.2 MATERIALS

15350.2.1 Link Seals shall be modular, mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening. The elastomeric element shall be sized and selected per manufacturer's recommendations and have the following properties as designated by ASTM:

A. For standard service applications (-40°F to 250°F) EPDM = ASTM D2000 M3 BA510

B. For Hydrocarbon service applications (-40°F to 210°F) NITRILE = ASTM D2000 M1BF510

C. For High temperature or Fire Seal applications (-67°F to 400°F) SILICONE = ASTM D2000 M1GE505

15350.4 CONSTRUCTION

15350.4.1 A complete Link Seal Assembly shall include the following:

A. Wall Opening. The wall opening shall be a steel sleeve, thermoplastic (HDPE) sleeve, cored hole or formed hole.

B. Link Seal. Sufficient quantity and type of Link Seal required to effectively provide a hydrostatic and/or fire-rated seal.

C. Each individual link shall be conspicuously and permanently identified with the name of the manufacturer and model number.

15350.3 METHOD OF MEASUREMENT

15350.3.1 This work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

15350.4 BASIS OF PAYMENT

15350.4.1 Complete compensation for the accepted work outlined in this Section shall be included in other bid items.

15480.1 DESCRIPTION

This section covers furnishing and installing compressed air piping, fittings, and specialties as shown on the Drawings and as required by these Specifications.

15480.1.1 RELATED WORK

Section 02105 - Earthwork Materials
Section 02200 - Trench Excavation and Backfill
Section 03050 - Portland Cement Concrete
Section 03100 - Concrete Forming, Finishing and Curing
Section 03200 - Concrete Reinforcement
Section 03500 - Concrete Structures and Slab Work
Section 09910 - Painting

15480.1.2 SUBMITTALS

15480.1.2.1 The Contractor shall submit for review complete information, showing all pipe, materials, fittings, gaskets, supports, mechanical restraints and configuration prior to the delivery of any components to the project. All information shall be provided in accordance with Section 01300 and written evidence of compliance from the manufacturer shall be provided with each delivery of material.

15480.1.2.2 As Construction proceeds, the Contractor shall submit test documentation in accordance with this section of these Specifications.

15480.1.3 DEFINITIONS

Not used.

15480.2 MATERIALS

Where materials not listed herein are required for completion of the compressed air piping system, these needs shall be submitted to the Engineer for review and approval prior to their purchase and installation.

15480.2.1 PIPE

Compressed air piping shall be ASTM A53, Schedule 40, seamless, galvanized steel pipe, or ASTM B88 Type K copper pipe.

15490.2.2 FITTINGS FOR GALVANIZED PIPE

15480.2.2.1 FOR PIPE 2 1/2 INCHES AND SMALLER - Fittings for galvanized steel pipe, 2 ½-inch and smaller, shall be 300# class galvanized malleable iron ANSI B16.3, and joint connections shall be prepared in accordance with ANSI B2.1. Threads shall be cut full and clean, using sharp dies. Threaded ends shall be reamed to remove burrs and to restore full inside diameter of the pipe.

15480.2.1.2 FOR PIPE 3 INCHES AND LARGER - Fittings for galvanized steel pipe 3-inch or larger shall be flanged 150# class, ANSI B16.5, full penetration, butt-welded, ANSI B 16.9, or grooved or shouldered mechanical couplings. Where mechanical couplings are used, the Contractor shall ensure that the pipe wall thickness meets the manufacturer's requirements for coupling installation for the required pressures and service.

15480.2.3 FITTINGS FOR COPPER PIPE

Fittings for copper piping shall be wrought copper, ASTM B75, or cast bronze, ASTM B62, 150# class. Joints shall be soldered, ANSI B16.18 or ANSI B16.22. Dual ferrule Swagelok™, or approved equal compression fittings are acceptable for lines under 2-inch. Underground or embedded pipe shall use soldered wrought copper fittings only, unless directed otherwise by the Engineer.

15480.2.4 PIPE COATING

Pipe coating shall be the standard Polyken Joint Wrap System:

15480.2.4.1 PRIMER - Polyken Pipeline Coatings Primer No. 927 is a composition of rubber solids and a solvent, which is readily applied to the properly prepared pipe surface. The primer's function is to prepare the pipe surface to effect a superior bonding medium between the pipe surface and the Polyken 930 Joint Wrap tape.

15480.2.4.2 TAPE - Polyken No. 930 Joint Wrap Tape consists of a polyethylene backing and a butyl rubber adhesive. This highly elastic product is specifically formulated to achieve a highly conformable, smooth and wrinkle free wrap when applied under tension to the primer-coated pipe surface. No. 930 is required in 35 mils total thickness.

15480.2.5 VALVES

15480.2.5.1 COMPRESSED AIR VALVES - Compressed air valves shall be swing-out style stainless steel ball valves, with reinforced TFE seats and stainless steel ball. The valves shall be prepared with female NPT connections on both ends. The valves shall be by Parker, Whitey, or approved equal.

15480.2.5.2 PRESSURE REDUCING VALVES - Pressure reducing valves shall be constructed with a zinc die cast body with a corrosion resistant coating and shall be furnished complete with a mounting bracket. The valves shall have balanced valve design nylon reinforced seals, Buna N diaphragm, and a self-cocking adjustment knob. The maximum inlet pressure rating shall be 250-psig. The output pressure range shall be 0-50 psi. The valves shall be furnished with a 0-160-psig pressure gauge. The valves shall be by Fisher, ARO, or approved equal.

15480.2.5.3 SOLENOID VALVES - Compressed air solenoid valves shall be ASCO, 8210 Series, 120 volt, normally closed, 150 psi operating differential, brass body, or approved equal.

15480.2.6 REGULATORS

Filter regulators shall be as manufactured by Watts, Fisher, ARO, or approved equal. Combination filter regulators shall operate between 5 and 125 psi and shall include an integral pressure gauge.

15480.2.7 FILTERS

15480.2.7.1 IN-LINE FILTERS - In-line filters shall be as manufactured by ARO, Fisher, or approved equal. In-line filters shall be coalescing type and shall have a replaceable filter element, polycarbonate bowl with guard, and a manual drain.

15480.2.7.2 DESSICANT FILTER - The desiccant filter, if required, shall be as manufactured by Deltech, Balston, or approved equal. The desiccant filter shall be a wall or frame mounted, packed column, desiccant media filter for absorption of moisture and oil. The replaceable media shall change color as it becomes exhausted. The desiccant filter shall be sized such that the capacity matches the compressor capacity.

15480.2.8 COUPLINGS

Quick couplings shall be ARO, Series 310, or approved equal.

15480.3 CONSTRUCTION REQUIREMENTS

The Contractor shall provide all materials and labor required to complete all work in accordance with the best practice of the trade, and to the satisfaction of the Engineer.

15480.3.1 CODE COMPLIANCE

All piping installed under this Section shall be installed in accordance with the Uniform Building Code and the Uniform Plumbing Code.

15480.3.2 DIAGRAMMATIC DESIGN

Piping layout on the Drawings shall be considered diagrammatic for all piping not shown with detailed dimensions. Drawings indicate the general location and arrangement of the piping systems. Pipe size and location are provided, but the Drawings are not intended to show every offset, fitting, or structural difficulty that will be encountered during project construction. Location and arrangement of piping layout take into consideration pipe sizing and friction loss, expansion, compressor sizing, and other design considerations. So far as practical, pipe shall be installed to neat lines and grades, as shown on the Drawings. However, piping alignment may be varied from that shown on the Drawings, to avoid structural or mechanical difficulties, or to avoid the work of other trades, at no additional cost to the Owner.

15480.3.3 HANDLING AND STORAGE OF PIPE COATING MATERIALS

Polyken primer and tape materials shall be stored and/or transported in their original factory containers or packages. Storage shall be under cover in locked, dry warehousing, and/or vehicles, up to the point of use. Storage shall be at normal room temperatures, and shall be away from radiators, stoves, heating pipes, and similar heat sources. Primer in drums or other metal containers should be stored in accordance with local regulations, as they apply to hazardous materials.

No. 930 Joint Wrap should not be stored or transported at high temperatures as blocking of 930 adhesive to its backing may occur. If this situation occurs, cooling of the roll will reverse this roll blocking and 930 will be totally functional.

Factory rolls and/or cartons of Polyken Joint Wrap coatings shall be stacked on end at all times, no more than 72 inches (2 meters) high. Stocks are to be rotated as new shipments are received.

15480.3.4 INSTALLATION OF PIPING SYSTEM

15480.3.4.1 VERIFICATION OF DIMENSIONS - The Contractor shall verify all dimensions by field measurements, and verify that all air distribution piping may be installed in accordance with pertinent codes and regulations, the original design, and the referenced standards.

15480.3.4.2 PIPING - Compressed air piping shall be installed with a 1/32” per foot (1/4 percent) downward slope towards drain points.

15480.3.4.3 JOINTS - Threaded joints shall be cleaned to remove cutting oil and shavings. Pipe joint compound suitable for compressed air system use shall be applied on the male threads at each joint. Finished joints shall be tight with no more than three threads exposed. Soldered joints shall be thoroughly cleaned and properly prepared and fluxed, to ensure properly soldered joints.

15480.3.4.4 SHUTOFF VALVES - Shutoff valves shall be installed on inlet of each quick coupler, and upstream of each PRV, filter, filter regulator, and elsewhere as indicated.

15480.3.4.5 COUPLERS AND FILTERS - Quick couplers and filters shall be installed on exposed piping where indicated.

15480.3.4.6 PRESSURE REGULATING VALVES - Pressure regulating valves shall be installed with inlet and outlet shutoff valves, and a pressure gage shall be installed at each valve outlet.

15480.3.5 PRESSURE TESTING OF PIPE

The Contractor shall test all new air distribution piping systems and parts of existing systems, which have been altered, extended or repaired for leaks and defects. The test method shall be a bubble test, unless otherwise authorized by the Engineer. All leaks and defects shall be repaired using new materials, and the system or portion thereof shall be re-tested until satisfactory results are obtained. Piping to be buried or to be installed under a building slab shall be pressure tested prior to burial or to the installation of the slab.

Pressure testing shall take place before the pipe is coated with the Polyken Wrap System.

15480.3.6 APPLICATION OF PIPE COATING

After successful pressure test, pipe to be buried or to be placed under concrete slabs shall be wrapped using the standard Polyken Joint Wrap System, which consists of Polyken Pipeline Coatings Primer No. 927 and Polyken No. 930 Joint Wrap Tape.

15480.3.6.1 PRIMER – Application of Polyken primer shall be as follows:

- All buried or under-slab piping shall be protected by one coat of Polyken pipeline primer.
- The pipe surface should be free of any moisture, mud, oil, grease, rust, or any other foreign material prior to the application of the Polyken primer. Visible oil and grease should be removed through the use of a suitable solvent. Kerosene shall not be used for cleaning.
- The primer should be thoroughly mixed or agitated prior to brushing onto pipe. This procedure will insure that any rubber solids that have settled out will be returned to proper solution.
- The primer should not be diluted. However, if the primer solids need to be dissolved again, use solvents recommended by a Polyken factory authorized representative.
- The primer shall be applied to the cleaned, dry pipe surface by brush at a coverage rate of approximately 400 square feet per gallon. The primer should cover all exposed pipe and joint surfaces, which will be buried or installed under a slab. Avoid runs and drips while applying the primer.
- Primer cans should remain covered when not in use to avoid solvent evaporation and contamination.

15480.3.6.2 TAPE – Application of Polyken tape shall be as follows:

- The Polyken primer shall be free of any surface contaminants and “tacky to dry” before the 930 Joint Wrap Tape is applied directly over the primer.

- No. 930 Joint Wrap coatings shall be installed in accordance with the width and lap specifications for the various pipe diameters listed in the Material Requirements chart:

  ⇒ Polyken 930 Joint Wrap tape shall normally be applied at a roll body temperature above 40°F (5°C) and at an ambient temperature above -30°F (-34°C). The joint wrap tape shall be stored up to the point of application under such conditions and for a sufficient period of time that the roll body temperature should be above 40°F (5°C) at the time of application.

  ⇒ The tape shall be applied to the pipe in a spiral fashion. The wrapping process should start at a minimum of 6 inches beyond the point where the pipe will be covered at the downside of the pipe. Caution should be taken during the wrapping process to avoid contaminating the tape with foreign material.

  ⇒ Two coats of Polyken tape shall be applied. This may be accomplished either by half lapping the primary wrap of No. 930 or by application of an initial wrap of tape with normally specified overlap followed by a second wrap over the initial wrap. If the second method of obtaining the double wrap is used, the overlaps of the first and second wraps must not coincide.

  ⇒ The joint wrap shall be ended so that the uncovered edge on the final lap is directed downward. This procedure will prevent any damage to the pipe joint wrap when the trench is backfilled.

- Use of a constant tension machine is required for all tape widths 6" or wider for proper tensioning of the tape. The joint wrap shall be applied under taut machine tension (approximately 5-10 lbs. per inch width) except for its initial and final 1/3 turns. Special attention should be given to specified overlapping of the joint wrap. A tapster or machine application is required.

- Prior to burying or otherwise covering the wrapped pipe, the coating shall be tested for holidays.

15480.3.7 FINISH WORK

15480.3.7.1 INSPECTION - The Contractor shall ensure that the Engineer's inspector shall inspect all compressed air system installations. New, altered, extended, or replaced compressed air distribution piping system shall not be enclosed, covered, or put into operation until it has been inspected and approved. All such work that has been covered or concealed before it has been tested and approved shall be exposed for testing.

15480.3.7.2 BACKFILL - After the backfill is completed, the tape can be trimmed back to the surface of the concrete slab or wall, but should be left in place for 6 inches above ground surface if outside.

15480.3.10.3 PURGING - The Contractor shall thoroughly purge all new air distribution piping systems and parts of existing systems, which have been altered, extended, or repaired prior to use.

15480.4 METHOD OF MEASUREMENT

15480.4.1 NO MEASUREMENT

Unless a separate bid item for furnishing and installing the work outlined in this Section is provided in the Bid Schedule, this work shall not be measured for separate payment, but shall be considered incidental to other items in the Bid Schedule.

15480.4.2 SEPARATE MEASUREMENT

Where items installed under this section are listed separately in the Bid Schedule, the items shall be measured at the unit rates for each item listed.

15480.5 BASIS OF PAYMENT

Complete compensation for the accepted work outlined in this Section shall be included in other bid items when no separate bid item is provided in the Bid Schedule for this work. When a separate bid item is provided in the Bid Schedule, complete compensation for this accepted work shall be included in the contract unit price on the Bid Schedule.

PAY ITEM	UNIT
Compressed Air Piping *(Type) (Size)*	Lineal Foot
Valve *(Type) (Size)*	Each
Pressure Reducing Valve *(Type) (Size)*	Each
Solenoid Valve *(Type) (Size)*	Each
Filter Regulator *(Type) (Size)*	Each
Filter *(Type) (Size)*	Each
Quick Couplers *(Type) (Size)*	Each

Golden Harvest, Inc.
Golden Gates™

Specification 15610SP: Steel Slide Gates

Model GH-46 Stainless Steel Slide Gates for Submerged Service

A. GENERAL

This section covers Stainless Steel Gates and Operators. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer.

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated gates.

APPROVED MANUFACTURERS

Gates supplied under this section shall be Model GH-46 Stainless Steel Gates as manufactured by Golden Harvest Inc. (800-338-6238) or engineer approved equal.

GOVERNING STANDARDS

Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of **AWWA-C561-14** standards.

QUALITY ASSURANCE

The manufacturer shall have 5 years experience in the production of substantially similar equipment, and shall show evidence of satisfactory operation in at least 10 installations. The manufacturer's shop welds, welding procedures and welders shall be qualified and certified in accordance with the requirement of the latest edition of AWS Sections D1.1, 1.2 and 1.6.

The fully assembled gates shall be shop inspected, tested for operation and fully adjusted before shipping. There shall be no assembling or adjusting on the job sites other than for the operating appurtenances.

SUBMITTALS

1. The manufacturer shall submit for approval by the purchaser, drawings showing the principal dimensions, general construction and materials used in the gate and lift mechanism.

2. The manufacturer shall submit for approval by the purchaser, engineering design calculations showing that lift and stem as well as slide deflection calculations at a minimum are in compliance with AWWA standards latest edition.

PERFORMANCE

LEAKAGE

Sluice gates shall be substantially watertight under the design head conditions. Under the design seating head, the leakage shall not exceed 0.05 US gallons per minute per foot of seating perimeter. Under the design unseating head, leakage shall not exceed 0.10 US gallons per minute per foot of perimeter.

B. MATERIALS AND CONSTRUCTION

GENERAL DESIGN

Gates shall be either self-contained or non self-contained of the rising or non-rising stem configuration as indicated on the drawings or gate schedule.

All parts of the gate shall have a minimum thickness of ¼ inch.

FRAME

The gate frame shall be stainless steel and designed for maximum rigidity.

The frame configuration shall be of the flush-bottom type and shall allow the replacement of the top and side seals without removing the gate frame from the wall or wall thimble.

SLIDE

The slide shall consist of stainless steel plate reinforced to limit deflection to L/360 of the span or 1/16-in, whichever is less, under the design head condition.

GUIDES AND SEALS

The guides shall be provided with ultra high molecular weight polyethylene seats on both sides of the slide and shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position. Guide frame shall not weigh less than 13 lbs. per foot.

Side and top seals shall be frame mounted. Seals shall be of a resilient neoprene P-seal with a stainless steel retainer bar. All seals shall be mechanical and fully adjustable. UHMW compression cord or UHMW contact seals will not be considered.

The flush bottom resilient neoprene seal shall be mounted to bottom of disc and seal against the invert portion of the frame. Frame mounted invert seals will not be considered.

WALL THIMBLE

Refer to the drawings for wall thimble type, wall thickness and applicable location. Minimum material thickness shall be ¼ inch.

F-type and E-Type wall thimbles shall be stainless steel, matching the material grade used to construct the slide gates.

Mechanical Joint (MJ) wall thimbles shall be of high strength – low carbon mild steel, prepped and coated with bitumastic 50 coal tar epoxy coating system or stainless steel as specified in the gate schedule.

YOKE AND PEDESTAL

Self-contained gate frames shall be provided with a yoke to support the operating bench stand. Yoke shall extend above

The yoke shall be formed by two structural members welded at the top of the guides to provide a one-piece rigid frame.

The maximum deflection of the yoke shall be L/360 of the gate width at maximum operating load.

Non-self contained gates shall be provided with pedestal and/or wall bracket mounted lifts. Steel or stainless steel as specified. All carbon steel shall be blasted and powder casted with industrial grade primer.

LIFTING ASSEMBLIES

STEM AND COUPLINGS

The operating stem shall be of stainless steel designed to transmit in compression at least 2 times the rated output of the operating manual mechanism with a 40 lb effort on the crank or handwheel.

The stem shall have a slenderness ratio (L/R) less than 200. The threaded portion of the stem shall have ACME type cold rolled threads with a maximum surface of 16 micro-inches. Machine cut threads will not be considered.

Where a hydraulic, pneumatic or electric operator is used, the stem design force shall not be less than 1.25 times the output thrust of the hydraulic or pneumatic cylinder with a pressure equal to the maximum working pressure of the supply, or 1.25 times the output thrust of the electric motor in the stalled condition.

Stems in more than one piece shall be joined together by solid couplings.

Gates having a width equal to or greater than two times their height shall be provided with two lifting mechanisms connected by a tandem shaft.

STEM GUIDES

Stem guides shall be fabricated from stainless steel. Stem guides shall be equipped with a UHMWPE

bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/R ratio shall not be greater than 200.

STEM COVER

Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents and a clear mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

LIFTING MECHANISM

Operators of the types listed in the schedule shall be provided by the gate manufacturer. Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 lb on the crank or handwheel, and shall be able to withstand, without damage, an effort of 80 lb.

Gearboxes shall be provided when required to maintain the operating force below 40 lb. All bearings and gears shall be totally enclosed in a weather tight housing. Operator housing shall be cast steel or cast iron. The pinion shaft of crank-operated mechanisms shall be supported by roller bearings. The operating shaft shall be fitted with a 2-inch square operating nut and removable crank. The crank shall be cast aluminum and fitted with a corrosion-resistant rotating handle. The maximum crank radius shall be 15 inches and the maximum handwheel diameter shall be 24 inches.

MATERIALS

Part	***Material***
Slide, Spigot, Frame, Stiffeners, Yoke, Guide Angles	Stainless Steel Type 304L or 316L ASTM A276 / A240
Side and Top Seals	Neoprene ASTM D-2000 G2BC 615
Invert Seal	Neoprene ASTM D-2000 G2BC 515
Bearing bars, Guides, Stem Guide Bushings	Ultra High Molecular Weight Polyethylene ASTM D4020
Threaded stem, Stem Guides	Stainless steel Type 304L or 316L ASTM A-276
Fasteners	Stainless steel Type 304 or 316 ASTM - F593 / F594
Pedestal	Steel ASTM A-36 or Stainless Steel 304L or 316L ASTM A312/276
Stem cover	Butyrate ASTM D-2411
Lift and stop nut	Bronze ASTM B584 / B505

Specification 15610SP: Steel Slide Gates

Model GH-65 Stainless Steel Slide Gates

A. General

This section covers In In-Channel Type Stainless Steel Weir Gates and Operators. The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer.

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified, or otherwise required for a complete, properly operating installation, and shall be the latest standard product of a manufacturer regularly engaged in the production of fabricated gates.

Approved Manufacturers

Gates supplied under this section shall be as manufactured by Golden Harvest Inc. or engineer approved equal.

Governing Standards

Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of AWWA-C561 Standards.

Quality Assurance

The manufacturer shall have 5 years experience in the production of substantially similar equipment, and shall show evidence of satisfactory operation in at least 10 installations. The manufacturer's shop welds, welding procedures and welders shall be qualified and certified in accordance with the requirement of the latest edition of AWS Sections D1.1, 1.2 and 1.6.

Submittals

1. The manufacturer shall submit for approval by the purchaser, drawings showing the principal dimensions, general construction and materials used in the gate and lift mechanism.

2. The manufacturer shall submit for approval by the purchaser, complete engineering design calculations in compliance with AWWA standards latest edition.

Leakage

Slide gates shall be substantially watertight under the design head conditions. Under the design seating head, the leakage shall not exceed 0.05 US gallons per minute per foot of seating perimeter. Under the design unseating head, leakage shall not exceed 0.10 US gallons per minute per foot of perimeter.

B. Materials and Construction

General Design

Gates shall be either self-contained or non self-contained of the rising stem or non-rising configuration as indicated on the gate schedule.

All parts of the gate shall have a minimum thickness of ¼ inch.

Frame

Gate frame shall be designed for in-channel as showing on the drawings or gate schedule.

The gate frame shall be stainless steel and designed for maximum rigidity.

The frame configuration shall be of the flush-bottom type and shall allow the replacement of the side seals without removing the gate frame from the wall.

Slide

The slide shall consist of stainless steel plate reinforced to limit deflection to L/720 of the gate span under the design head.

Guides and Seals

The guides shall be provided with ultra high molecular weight polyethylene UHMW seats on both sides of the slide and shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position. Guide frame shall not weigh less than 9 lbs. per foot.

Seals shall be frame mounted. Seals shall be resilient neoprene of the J-bulb type with a stainless steel retainer bar. Seals shall be fully adjustable. UHMW seals alone will not be considered.

The flush bottom resilient neoprene seal shall be mounted to bottom member of the frame

Yoke

Gates shall be provided with a yoke to support the operating bench stand.

The yoke shall be formed by two structural members welded at the top of the guides to provide a one piece rigid frame. The maximum deflection of the yoke shall be L/360 of the gate span or ¼", whichever is less.

Stem and Couplings

The operating stem shall be of stainless steel designed to transmit in compression at least 2 times the rated output of the operating manual mechanism with a 40 lb effort on the crank or handwheel. Tube or pipe stem sections will not be considered.

Gates having a width equal to or greater than two times their height shall be provided with two geared lifting mechanisms interconnected by shaft and flexible jaw-type couplers.

The stem shall have a slenderness ratio (L/R) less than 200. The threaded portion of the stem shall have Acme type cold rolled threads with a maximum surface of 16 micro-inches.

Stems in more than one piece shall be joined together by solid stainless steel or bronze couplings.

Stem Guides

Stem guides shall be fabricated from stainless steel. Stem guides shall be equipped with a UHMWPE bushing. Guides shall be adjustable and spaced in accordance with the manufacturer's recommendation. The L/R ratio shall not be greater than 200.

Stem Cover

Rising stem gates shall be provided with a clear butyrate plastic stem cover. The stem cover shall have a cap and condensation vents and a clear Mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

TABLE: MATERIALS

Part	Material
Slide, Spigot, Frame, Stiffener, Yoke, Guide Angle, Stem Guide	Stainless steel Type 304L or 316L ASTM A-276 / A-240
Gate Seals	Resilient Neoprene ASTM D-2000
Guide Liner, Stem Guide Bushing	Ultra High Molecular Weight Polyethylene ASTM D4020
Operating Stem, Stem Coupler	Stainless steel ASTM A-276, Type 304 or 316
Fasteners, Anchor Bolts	Stainless steel Type 304 or 316 ASTM - F593 / F594
Stem Cover	Butyrate ASTM D-2411
Lift Nut, Stop Nut	Manganese bronze ASTM B584

Manual Lifting Mechanism

Operators of the types listed in the schedule shall be provided by the gate manufacturer.

Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 lb on the crank or handwheel, and shall be able to withstand, without damage, an effort of 80 lb.

Gearboxes shall be provided when required to maintain the operating force below 40 lb. All bearings and gears shall be totally enclosed in a weather tight housing. Operator housing shall be cast steel or cast iron. The pinion shaft of crank-operated mechanisms shall be supported by roller bearings. The operating shaft shall be fitted with a 2 inch square operating nut and removable crank. The crank shall be fitted with a corrosion-resistant rotating handle. The maximum crank radius shall be 15 inches and the maximum handwheel diameter shall be 24 inches.

Remote Actuators: When specified or the yoke height is greater than 54 inches above the operating floor, a remote handwheel or crank with bearing housing and sprocket shall be bolted to the frame at approximately 42” above the operating floor elevations. A removable stainless steel cover shall be provided to protect the extension shaft, drive chain, and/or sprockets.

16065.1 GENERAL

16065.1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions

16065.1.2 SUMMARY

A. Section includes lightning protection for structures.

16065.1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.
2. Include indications for use of raceway, data on how concealment requirements will be met and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

16065.1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified installer and manufacturer. Include data on listing or certification by UL.
B. Certification, signed by Contractor, that roof adhesive is approved by manufacturer of roofing material.
C. Field quality-control reports.
D. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems, "for maintenance of the lightning protection system.
E. Other Information Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:
   1. Ground rods
   2. Ground loop conductor

16065.1.5 QUALITY ASSURANCE

A. Installer Qualifications: Certified by LPI as a Master Installer/Designer, trained and approved for installation of units required for this Project.
B. System Certificate:
   1. UL Master Label
   2. LPI System Certificate
   3. UL Master Label Recertification
C. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

16065.1.6 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components and building finishes.

16065.2 PRODUCTS

16065.2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96 and NFPA 780
B. Roof-Mounted Air Terminals: NFPA 780
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work included; but not limited to, the following:
   2. Basis of Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. VFC
      b. East Coast Lightning Equipment, Inc.
      c. ERICO International Corporation
      d. Harger
      e. Heary Bros. Lightning Protection Co., Inc.
      f. Independent Protection Co.
      g. Robbins Lightning, Inc.
      h. Thompson Lightning Protection, Inc.
   3. Air Terminals More Than 24-inches Long: With brace attached to the terminal at not less than half the height of the terminal
   4. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in roofing Sections.
C. Main and Bonding Conductors: Copper or aluminum.
D. Ground Loop Conductor: The same size and type as the main conductor excepted tinned.
E. Ground Rods: Copper-clad steel (sectional type): 5/8-inch in diameter by 96-inches long.
F. Heavy-Duty, Stack-Mounted, Lightning Protection Components: Stainless steel, solid copper, monel metal or lead sheathed.

16065.3 EXECUTION

16065.3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A and NFPA 780.
B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.
C. Conceal the following conductors:
   1. System conductors
   2. Down conductors
   3. Interior conductors
   4. Conductors within normal view of exterior locations at grade within 200 feet of building.
D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.
E. Cable Connections: Use exothermic-welded connections for all conductor splices and connections between conductors and other components.
   1. Exception: In single-ply membrane roofing, exothermic-welded connections may be used only below the roof level.
F. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.
G. Bond extremities of vertical metal bodies exceeding 60 feet in length to lightning protection components.
H. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure, area or item indicated.

1. Bury ground ring not less than 24 inches from building foundation.
2. Bond ground terminals to the ground loop.
3. Bond grounded building systems to the ground loop conductor within 12 feet of grade level.

I. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot intervals.

16065.3.2 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

16065.3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
B. Use conductors with protection coatings where conditions cause deterioration or corrosion of conductors.

16065.3.4 FIELD QUALITY CONTROL

A. Notify Architect at least 48 hours in advance of inspection before concealing lightning protection components.
B. UL Inspection: Meet requirements to obtain a UL Master Label for system.
C. LPI System Inspection: Meet requirements to obtain an LPI System Certificate.

1 PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

- Specification for an Automatic Transfer Switch (ATS) for installation and operation on legally required standby applications for emergency power systems as defined by the National Electrical Code (NEC) or Canadian Electrical Code (CEC).

- It is intended for the Automatic Transfer Switch to operate in the following modes:

a. The ATS shall continually monitor the condition of the utility supply voltage/frequency and shall automatically respond to a utility power failure condition by issuing an engine start signal to the emergency standby generators(s) in the system.

b. The ATS shall automatically transfer the emergency load to the generator supply in the event of a utility supply failure and return the load to the utility supply upon restoration.

c. The ATS shall perform an open transition power transfer with a neutral delay period between operating generator and the utility supply once the utility power source has been restored.

d. When an On Load test mode is activated, the ATS shall automatically transfer the emergency load to the generator supply and return the load to the utility supply upon test completion.

- All work defined within this specification shall be the responsibility of the Automatic Transfer Switch manufacturer, unless specifically defined as provided and/or installed by others.

B. The automatic transfer switch shall be manufactured in accordance with this specification and applicable UL, CSA, NEMA, and ANSI standards.

C. Supplier shall be responsible for ensuring the compatibility of all components of the ATS.

D. The contractor shall furnish and install the Automatic Transfer Switch in accordance with local bylaws, the National Electrical Code (NEC) or Canadian Electrical Code (CEC) specification and contract drawings.

E. Include all components, commissioning and services specified or as required to provide and install a complete and operable automatic transfer switch.

F. The Automatic Transfer Switch package shall include the following main components:

- ATS Enclosure

- Power Switching Mechanism

- Automatic Transfer Switch Controller:

a. Operator Interface Display

b. Source Voltage & Frequency Sensors

c. ATS control logic c/w Integrated Time Delays, Inputs & Outputs

d. Engine Start Output Contact

e. Load Bus Power Metering

f. Remote Communication Modbus™ Port

1.2 APPROVAL SUBMITTALS

A. Two sets of the following information shall be supplied for ATS approval submittal:

- ATS Physical Layout (Plan view)

a. ATS Ratings

b. Anchoring Details

c. Cable Entry/Exit Locations

d. Cable Connection Sizes

e. Nameplate Information

- ATS Schematic Drawings

f. Customer Input/output Electrical Connections

g. Device settings

- ATS Product Datasheets

B. The following shall be shipped with the equipment:

- Two sets of As - Built Drawings
- Hard copy of all Installation Guides.

1.3 CODES & STANDARDS

A. The Automatic Transfer Switch shall be designed, manufactured, tested and listed to the following safety standards:

- UL 1008 Edition 7 Automatic Transfer Switches For Use in Emergency Systems

- UL 869A Reference Standard Service Equipment

B. The ATS Controller shall be designed in accordance with the following performance standards:

- Immunity Testing;

a. EN 61000-4-2:2009, ESD

b. EN 61000-4-3: 2006 RF Immunity

c. EN 61000-4-4: 2006 EFT

d. EN 61000-4-5: 2006 Surge Voltage

e. EN 61000-4-6: 2009 RF Common Mode

f. EN 61000-4-11: 2004 Voltage Dips and Interruptions

g. EN 61000-4-8: 2010 Power Frequency Magnetic Field Immunity

h. ANSI C62.41.2: 2002 Surge 100kHZ Ring Wave & Combination Wave, Category C

- Emissions Testing:

i. FCC CFR Part 15, Subpart B, Class A (Radiated & Conducted Emissions)

j. ICES-001 Issue 4, Class A (Radiated & Conducted Emissions)

k. EN 61000-6-4:2007 (Radiated & Conducted Emissions, Harmonics, Flicker)

1.4 QUALITY ASSURANCE

A. The Transfer Switch shall be designed and manufactured in a facility, which is registered to an ISO 9001:2008 quality system. The supplier shall have a minimum of 30 years experience designing and manufacturing automatic transfer switches.

B. Only new materials and components shall be used and of current manufacture.

C. The unit shall be manufactured in accordance with this specification and applicable UL, CSA, and NEMA standards.

1.5 WARRANTY

A. The equipment shall be free of defects in material, workmanship and operation.

B. The Transfer Switch shall be warranted against defective components, workmanship and operational flaws for the period of two years from the date of startup.

C. Date of startup shall be when the manufacturer's representative completes the site startup or when the

equipment is put into operation, whichever occurs first.

D. Date of shipment shall be shipment from the supplier or completion of manufacturer in the event the equipment is held at the owner's request.

1.6 ENVIRONMENTAL CONDITIONS

A. The Transfer Switch shall be installed with ambient temperatures between +5° to +122° Fahrenheit (-15° to +50° Celsius) relative humidity from 0-95% non-condensing, and altitude not exceeding 6600 ft (2200M).

2 PART 2 – PRODUCTS

2.1 MANUFACTURERS

Specification writer's note: Insert text to suit the applicable manufactures for this equipment

A. Thomson Power Systems

2.2 RATINGS & CONSTRUCTION

A. Rating of the automatic transfer switch shall be 2000 AMP, 480 VAC, 60Hz, 3 PHASE, 4WIRE.

B. The transfer switch shall comprise of 4 switching poles

C. The automatic transfer switch assembly shall be rated for 100% continuous load without de-rating. The automatic transfer switch shall be suitable for control of motors, electric discharge lamps, tungsten filament lamps, and electric heating equipment where the sum of motor full-load ampere ratings and the ampere ratings of other loads do not exceed the ampere rating of the switch and the tungsten load does not exceed 30 percent of the switch rating.

D. Short Circuit fault withstand current rating of the complete assembly shall be 100Kamps RMS for up to 3 Cycles. The interrupting and closing rating shall be equal to or exceed the required withstand rating. This rating shall be obtained with standard upstream over current protection devices.

E. The automatic transfer switch must be listed or certified to the following safety standards:

UL 1008 Edition 7 Automatic Transfer Switches For Use in Emergency Systems

F. The complete ATS assembly shall be mounted in a NEMA 1 type enclosure for indoor use.

G. Dimensions: Overall height, maximum 91 5/8" (2330mm) (including base channels). Individual cubicle width, maximum 36" (915mm) for transfer switches rated up to 3000A. Transfer switches rated at 4000A shall have individual cubicle width of 48" (1219mm).

H. The rear section shall contain bussing and provisions for customer incoming and outgoing line and load cables. Access shall be from the rear by removable rear covers.

I. Ground Lugs/Bus: Adequate size and quantity of ground lugs shall be provided and shall conform to NEC/CEC guidelines. Where a ground bus is provided, it shall be a full length copper ground bus bonded to the frame with adequate size and quantity of ground lugs and shall conform to NEC/CEC guidelines.

J. Busbars: Where load bus bars are utilized, they shall be tin plated round-edge high conductivity copper and be sized for 100% continuous load rating of the transfer switch, in accordance with NEMA, CSA and UL guidelines. The short circuit withstand rating of the completed bus assembly shall be not less than the short circuit fault current of the system.

K. Cable Connections: Provision shall be made to terminate all incoming and outgoing power cables and

grounding conductors. Connections shall be via screw type cable lugs.

L. The automatic transfer switch shall be constructed to accommodate bottom entry of incoming generator power cables, incoming utility power cables and bottom exit of outgoing load cables.

M. The power switching units shall be of draw-out (DO) construction, utilize fully enclosed contacts and their withstand/closing rating shall be equal to or exceed the required withstand rating of the complete mechanism.

N. All materials and parts used in the unit shall be new, of current manufacture, of best industrial grade, and free from defects and imperfections.

O. The transfer switch mechanism shall provide a simple means of manual operation.

P. All internal control devices used in the automatic transfer switch shall be capable of being de-energized and isolated from the system by use of an accessible isolation plug for servicing procedures as required.

Q. The automatic transfer switch design shall provide front accessible components and wiring for easy serviceability. Power or control connections, which are not readily serviceable while the transfer switch is mounted in its enclosure, are not acceptable.

R. All power contacts used shall operate in a quick-make / quick-break manner, the speed of which shall be independent of supply voltage and / or speed of operation by manual means.

S. The enclosure shall consist of a 14 gauge steel angle or channel framework and be of adequate strength and rigidity to endure normal conditions of use and to support all equipment mounted within. Bolt-on steel panels and hinged doors shall form the outer shell of the enclosure.

T. SEISMIC ANCHORING

- The Transfer Switch shall be designed and constructed to withstand seismic events when correctly anchored to the building structure.
- The Transfer Switch assembly shall comply with the relevant section of the International Building code standard IBC 2012 and shall be type tested on a shaker table to ACC 156 Standard.
- The Transfer Switch shall successfully withstand a seismic event with a spectral acceleration of minimum 200%.
- Specific Transfer Switch anchoring detail drawings shall be furnished by the Transfer Switch supplier to the contractor for compliance of seismic ratings.
- Transfer Switch supplier shall provide a seismic certificate of compliance upon request.

U. ENCLOSURE FINISH

- The surface shall be free of nicks and abrasions and all sharp edges broken in preparation for painting the surface. The surface shall then be prepared with iron phosphate treatment and primer. The final coat to be UL approved electrostatically applied powder coat ASA 61 Grey.

2.3 AUTOMATIC TRANSFER SWITCH FEATURES

A. The transfer switch shall be supplied with multi-voltage capability to allow use on a variety of standard system voltage levels without replacement of components. The transfer switch shall be field configurable to operate on the following nominal system voltages; 208V, 240V, 380V, 480V, 600V.

B. Transfer switch control power shall be obtained from the source being transferred to. The controls shall not require any connection to external power sources for normal automatic operation. Transfer switches requiring control power solely from the engine starting (or other) batteries are not acceptable.

C. A control circuit isolation plug shall be provided to isolate all control circuitry inside the transfer switch to facilitate maintenance procedures. When isolated, there shall be no voltage present on the control circuitry.

D. The transfer switch shall have control plugs for all interconnection to provide superior serviceability. Separate plugs shall be provided for voltage sensing, ATS controller, engine start outputs, programmable I/O and communications. All plugs shall be keyed to prevent incorrect installation.

E. The automatic transfer switch shall include a fully integrated microprocessor-based Transfer Switch Controller which shall provide the following key features:

- Graphical 7" Color Touch Screen Operator Interface Display
- Open and/or Closed Transition Transfer Control
- Utility/Gen Voltage and Frequency Metering
- Load Bus 3 Phase Power Metering (Optional)
- Modbus™ RTU Serial Communication
- Modbus™ TCP/IP Ethernet Communication
- 8 Programmable Relay Output Contacts
- 16 Programmable Digital Inputs
- Engine Start Output Contact

F. The transfer switch controller shall include an operator interface graphical color touch screen display which shall be door mounted. The display shall contain the following features:

- 7.0 inch Diagonal Color Display Screen
- Capacitive Touchscreen

- Resolution 800 x 480 (WVGA)
- Wide Viewing Angle
- Serial, Ethernet, USB Ports
- SD Card Memory Card

G. The transfer switch controller display shall provide easy to navigate software menu screens for all ATS system information and control. The following information shall be displayed within the software menuing system:

- System Time/Date
- ATS Power Mimic Bus
- Source Available/ATS Position Indication
- Utility supply metering – 3 phase voltage and frequency
- Generator supply metering – 3 phase voltage and frequency
- ATS Load metering – 3 phase voltage
- Timer countdown display
- ATS Control Modes (Auto/Off/Manual/Engine Start)
- Data Logging of Events
- Alarm Summary
- Alarm Logs
- Event Logs
- Virtual Synchroscope
- Calendar-Based Exercise Scheduler

H. The Transfer Switch Controller shall be an Intelligent Electronic Device (IED) which shall have a unique Internet Protocol (IP) Address for programming/configuring and remote communication.

I. The Transfer Switch Controller shall be capable of operating in conjunction with other ATS controllers on a common Ethernet communication network.

J. Password Security: The transfer switch controller software program shall include a three (3) level security password system for access to all programming functions. Specific password levels shall be provided for “read only”, “read/write” and “administrator”. Password security shall allow for users to be named with individual user names and login passwords.

K. All programming/configuring of the transfer switch controller set points including voltage, frequency and time delays shall be software programmable from the front door mounted graphical display screen.

L. Utility/Gen Metering: Digital and Analog (i.e. graphical representative) metering shall be provided by the transfer switch controller for the Utility and Generator supplies. The transfer switch controller shall have an accuracy of +-0.5% (Full Scale) for all voltage and frequency readings. The following standard metering features shall be provided for the utility and generator supplies;

- Digital and graphical analog display of AC voltages
- Three phase or single phase voltages (Line to Line & Line to Neutral)
- Phasor diagram showing graphical phase relationship and voltage magnitude
- Symmetrical Component Diagrams (Positive, Negative & Zero sequence display)
- Voltage phase rotation indication
- Frequency display to 0.1Hz resolution

M. Voltage/Frequency Sensing: The ATS controller shall provide the following voltage and frequency sensing control features for the utility and generator supplies:

- The Transfer Switch controller shall have fully integrated 120-600V, 3 phase true RMS AC voltage sensing on the Utility Supply, generator supply and ATS Load bus for operation and monitoring. Programmable set points shall be provided for utility/generator source under voltage, overvoltage and phase unbalance.
- AC voltage sensing shall utilize advanced symmetrical component algorithms to determine positive, negative and zero sequence voltages. This shall provide the capability to detect true phase loss/unbalance (i.e. single phasing) protection on 3 phase systems where re-generative phase voltages maybe present due to failed 3 phase transformers or motor loads.
- AC Voltage sensing shall be fully configurable to allow operation on 3 phase 3 wire or 3 phase 4 wire systems without use of additional potential transformers on systems 600VAC or below.
- Phase Sequence & Phase Reversal Protection: Phase Sequence/Phase reversal protection shall be provided to inhibit transfer between alternate sources should an incorrect phase sequence condition exist between connected sources. The Transfer Switch controller shall provide capability to program either A-B-C or C-B-A phase rotation.
- Under Voltage Sensing: Three phase under voltage sensing shall be provided for both utility and generator supplies. Activation of an abnormal under voltage condition on any phase shall initiate a load transfer to the alternate source or shall inhibit a transfer to a source until its voltage levels are within normal limits. The under voltage sensor shall be user adjustable from 70-100% of nominal and shall be based on a falling (i.e. drop-out) voltage. The under voltage sensor shall be factory set for drop-out at 85% nominal voltage. The under voltage sensor shall reset (i.e. pick-up) 5% above the dropout setting and shall be adjustable. The under voltage sensor shall include an adjustable transient

time delay feature.

- Over Voltage Sensing: Three phase over voltage sensing shall be provided for both utility and generator supplies. Activation of an abnormal over voltage condition on any phase shall initiate a load transfer to the alternate source or shall inhibit a transfer to a source until its voltage levels are within normal limits. The over voltage sensor shall be user adjustable from 100-130% of nominal and shall be based on a rising (i.e. pick-up) voltage. The over voltage sensor shall be factory set for pick-up at 115% nominal voltage. The over voltage sensor shall reset (i.e. drop-out) 5% below the pick-up setting and shall be adjustable. The over voltage sensor shall include an adjustable transient time delay feature.

- Phase Unbalance/Phase Loss Sensing: Voltage phase unbalance/phase loss sensing shall be provided for the generator and utility supplies. Activation of an abnormal utility phase unbalance condition shall initiate the generator to start and to transfer on load. The voltage phase unbalance sensor shall be user adjustable from 3-30% of nominal and shall be factory set for pick-up at 5% nominal voltage. The voltage phase unbalance sensor shall include an adjustable transient time delay feature.

- Under Frequency Sensing: Under frequency sensing shall be provided for both utility and generator supplies. Activation of an abnormal under frequency condition shall initiate a load transfer to the alternate source or shall inhibit a transfer to a source until its frequency levels are within normal limits. The under frequency sensor shall be user adjustable from 70-100% of nominal and shall be based on a falling (i.e. drop-out) frequency. The under frequency sensor shall be factory set for drop out at 80% nominal frequency. The under frequency sensor shall reset (i.e. pick-up) 10% above the dropout setting and shall be adjustable. The under frequency sensor shall include an adjustable transient time delay feature.

- Over Frequency Sensing: Over frequency sensing shall be provided for both utility and generator supplies. Activation of an abnormal over frequency condition shall initiate a load transfer to the alternate source or shall inhibit a transfer to a source until its frequency levels are within normal limits. The over frequency sensor shall be user adjustable from 100-130% of nominal and shall be based on a rising (i.e. pick-up) frequency. The over frequency sensor shall be factory set at 115% nominal voltage. The over frequency sensor shall reset (i.e. drop-out) 5% below the pick-up setting and shall be adjustable. The over frequency sensor shall include an adjustable transient time delay feature.

N. Time Delays: The following time delay functions shall be provided within the transfer switch controller:

- Engine Start - A time delay on engine start shall be provided to delay the engine start signal after failure of the utility source. The time delay shall be user adjustable 0 - 60 seconds, factory set at three (3) seconds.

- Engine Warmup - A time delay for engine warm up shall be provided which permits transfer to the generator supply after generator voltage and frequency have reached acceptable limits. The time delay shall be user adjustable 0 - 60 minutes, factory set at two (2) seconds.

- Utility Return - A time delay for return to utility shall be provided which permits a re-transfer back to the utility supply only after stable voltage and frequency condition exists for the specified time period. The time delay shall be user adjustable 0 - 60

minutes, factory set at two (2) minutes.

- Engine Cooldown - A time delay for engine cooldown shall be provided which delays the engine stop signal after load has re-transferred back to the utility source. The time delay shall be user adjustable 0 - 60 minutes, factory set at two (2) minutes.

- Neutral Delay - A time delay for neutral position shall be provided in the open transition mode to minimize the effect of out-of-phase transfer due to connected motor load. The time delay shall be user adjustable 0 - 120 seconds, factory set at three (3) seconds.

- Gen Commit to Transfer Delay - A time delay for Gen Commit to Transfer position shall be provided. Should the generator fail to transfer on load with the "commit to transfer" feature enabled, the ATS shall automatically re-transfer back to the utility supply if within nominal limits following timeout of the "Gen Commit to Transfer" timer. The time delay shall be user adjustable 0 - 600 seconds, factory set at three hundred (300) seconds.

- Transfer Fail Delay - A time delay for Transfer Fail delay shall be provided. The timer shall activate a fail alarm condition if the transfer switch fails to successfully transfer within the transfer fail time delay setting. The time delay shall be user adjustable 0 - 600 seconds, factory set at thirty (30) seconds.

O. Timer Bypass: The transfer controller shall provide a timer bypass function to automatically bypass unwanted delays during testing or maintenance procedures. The timers shall automatically reset on the next operation sequence to their original setting. The following time delays shall have a user initiated bypass feature:

- Engine Warmup Delay

- Utility Return Timer

- Engine Cooldown Timer

- Neutral Delay Timer

P. Real-Time Clock: The transfer controller shall provide a real-time clock to display system time and date for use by event logging and the ATS exercise scheduler. The real-time clock shall have automatic shifting of date/time for daylight savings and leap year occurrences. The real-time time clock shall be powered by an independent 10 year life battery to maintain all time/date settings upon loss of control power.

Q. ATS Status Indication: The transfer switch controller shall provide the following indication lights/icons on a common screen for simple visual indication of ATS status:

- Utility/Gen Source available

- Load Bus Energized

- ATS Position: Utility or Generator Source Connected to Load

- Engine Start Signal Initiated

- ATS in TEST or Exercise Mode
- Load Shed is active
- Current ATS Operating Mode (Auto/Off/Man/Test)
- Common alarm (Flashing Icon)
- Security Access Locked/Unlocked

R. Alarm Annunciation: The transfer switch controller shall provide an alarm annunciation screen to indicate the status of all individual alarm conditions on the ATS. The alarm screen shall have an alarm reset function.

S. Alarms Log: The transfer switch controller shall provide an alarm log screen to indicate a history of recent alarms. All alarm logs shall be provided with a time/date stamp and the name of user who reset the alarm. Alarm logs can be filtered by calendar date.

T. Events Log: The transfer switch controller shall provide an event log screen to indicate a history of recent events. All event logs shall be provided with a time/date stamp and the name of user who activated/deactivated a specific event. Event logs can be filtered by calendar date.

U. Virtual Synchroscope: For transfer switches equipped with open transition -fast transfer or closed transition transfer mechanisms, the transfer controller display shall indicate the operating status of the "in-sync" transfer operation. Operating status shall include the following display features:

- Virtual Synchroscope showing graphical phase degree and speed (slow-fast) representation between the two sources prior to transfer operation.
- Voltage Difference meter displayed in % system voltage
- Slip Frequency meter displayed in % of system frequency
- Generator and Utility Phase A-N voltage
- Generator and Utility frequency

V. ATS Control Mode: The transfer switch controller shall provide 7 selectable operating modes available from the main operating screen. The following operating modes shall be provided:

- Auto: ATS shall operate automatically during a utility power failure
- Off: ATS shall not start engine or transfer load during a utility power failure
- Manual: ATS can be operated manually to the desired source.
- On Load Test: ATS shall be selected to operate in On-Load test mode and permit load transfer
- Off Load Test: ATS shall be selected to operate in Off-Load test mode and shall not permit load transfer

- Timed Test: ATS shall be selected to operate in a Timed test mode

- Closed Transition: ATS shall be selected to operate in a Closed Transition Transfer mode

W. Utility Retransfer Operation Selection: The operator interface display shall provide a selection for Utility Re-transfer operation. The utility re-transfer operation shall be user selectable for Automatic, or Manual re-transfer operation. When Manual re-transfer mode is selected, the user can initiate when the re-transfer to utility power shall occur.

X. Test Modes: The transfer switch controller shall provide the following user selectable test modes and features:

- On Load/Off Load: The operator interface shall provide selection of "OFF-LOAD" testing (i.e. load does not transfer to generator) or "ON-LOAD" testing (i.e. load transfers to generator) modes.

- Automatic Timed Test Modes: Automatic timed test mode shall be provided to allow for tests to be manually initiated and automatically terminated. Timed test modes shall be user adjustable (0-999 minutes). The load shall automatically re-transfer back to the utility supply should the generator fail on load.

- Automatic Gen Exerciser: A calendar based automatic exercise time function shall be provided for generator testing. The Exercise scheduler shall be fully programmable for; start/stop date & time, duration of the test and type of test mode (i.e. On-Load or Off-Load). The exercise timer shall utilize the transfer controller's internal time clock for referencing all timing functions. The transfer switch shall automatically re-transfer back to the utility supply if the generator set fails during an exercise period.

Y. Scheduler: A calendar based scheduler shall be provided by the transfer switch controller. The scheduler shall operate based on the transfer switch controller real-time clock. The scheduler shall allow users to program over 25 specific event schedules to be added. Each event can be edited individually and it operating status can be monitored. The scheduler shall allow the following programming functionality:

- Schedule Event Start Date/Time

- Event Period (Day/Week/Month/Year)

- Schedule Event Stop Date/Time

- Event Duration (mins/hours)

- Event Operation Type (Off-Load Test, On-Load Test)

- Number of Re-occurring Events (one-time or number of events)

Z. Transfer Switch Fail Logic: The following transfer switch failure logic and alarming shall be provided during open or closed transition transfer sequences

- Transfer Fail: Control logic shall be provided for sensing a transfer switch failure in open or closed transition mode. When an alarm condition is activated, the transfer

controller shall automatically force a transfer to the alternate source if available.

- Power Switching Device Fail: Control logic shall be provided to detect if a power switching device fails to close or open during an open or closed transition operating sequence. Should a power switching device fail to close or open for any reason within a pre-set time period (adjustable), an alarm light and alarm relay contact shall be activated.

- Gen Failure: Control logic shall be provided for immediate transfer to the utility supply (if within acceptable limits) should the generator set fail during any activated test mode.

AA. Gen Commit to Transfer Logic: Programmable control logic shall be provided to select whether or not the load shall be transferred to the generator (following a utility power failure) if the utility supply is restored immediately before the generator transfers on load. With the feature programmed as NO (DISABLED), the transfer switch shall not commit a transfer to the generator after the engine start delay has expired, but shall return to the utility supply if immediately restored. With the feature programmed as YES (ENABLED), the transfer switch shall commit a transfer to the generator after the engine start delay has expired. This feature shall be automatically cancelled after expirary of the Gen Commit to Transfer timer (5 mins adjustable) should the generator fail to start.

BB. Load Disconnect Contact (LDC): Control logic shall be provided to signal an external load (e.g. elevator) of an impending transfer to and from the generator supply. A single normally open output contact shall be supplied and shall be rated 2A, 120VAC, 28Vdc resistive. The contact shall close prior to a transfer and remain closed until the transfer is completed and the post transfer delay time has expired. A pre-transfer delay function shall be provided, programmable 0 - 30 seconds. A post transfer delay function shall be provided, programmable 0 - 30 seconds.

CC. Engine Start Contacts: Two (2) engine start contacts shall be provided which shall close to initiate starting of the engine. The engine start contact shall be rated 7A, 120/240VAC, 28Vdc resistive.

DD. Load Shed: The transfer controller shall have provisions to provide a load shed output contact via assignment of one of the programmable output contacts. The Load shed output shall be activated whenever the generator transfers on load and shall reset once the utility supply retransfers back on load. If the ATS is equipped with ATS Load bus power metering option, the Load shed feature shall be programmable based on a generator kW load set point.

EE. User Programmable Digital Inputs: Sixteen (16) user programmable digital inputs shall be provided by the transfer controller. The digital inputs shall accept a dry (isolated) logic contact to switch to DC negative (ground). Each input shall allow mapping to over 30 different control or monitoring functions as available within the transfer controller database. The following inputs shall be mapped as factory defaults:

- Remote Test - Utility Power Fail Simulate (Close to Test)

- Remote Alarm Reset (Momentary Close to Reset)

- Service Disconnect Mode Activated (External Control Switch)

- Utility Power Switching Device (USD) Tripped

- Generator Power Switching Device (GSD) Tripped

- Transfer Control in Manual (External Control Switch)

- Transfer Control in Closed Transition Mode (External Control Switch)
- Utility Power Switching Device (USD) Open
- Generator Power Switching Device (GSD) Open
- Generator Bypass Switch (GB) Closed
- Utility Bypass Switch (NB) Closed
- Load Isolate Switch (LI) Closed
- Generator Isolate Switch (GI) Closed
- Utility Isolate Switch (NI) Closed
- Inhibit Transfer to Utility (Source 1)
- Inhibit Transfer to Generator (Source 2)

FF. User Programmable Output Contacts: Eight (8) user programmable output contacts shall be provided by the transfer controller. The contacts shall be rated 2A, 120/240VAC, 28Vdc resistive, Form C. Each output contact shall be user programmable. The following outputs shall be mapped as factory defaults:

- Load on Utility (AUX U)
- Load on Generator (AUX G)
- Load Disconnect Contact (LDC)
- Fail to Transfer (FTT)
- ATS Not in Auto
- ATS in Auto
- Utility Power Available (UPA)
- Generator Power Available (GPA)

GG. Transfer to Generator Inhibit: Controller shall provide a programmable digital input to inhibit transfer to generator until external signal is removed. Input can be utilized in multiple generator/ATS applications, to inhibit transfer to generator until external logic has determined the specified number of "on-line" generators has been reached. Note: Transfer to Generator inhibit shall be automatically bypassed should the utility source fail and the generator source is available within normal limits

HH. In-Sync Transfer Sensor: For transfer switches equipped to operate in a fast "open" or "closed" transition transfer sequence, the transfer switch controller shall provide an integrated "in-sync" transfer sensor to safely permit in-sync transfers to occur when both sources are available. The in-sync

transfer sensor shall provide adjustable voltage and frequency thresholds to only permit transfers when the two sources are safely in phase. The in-sync sensor shall also provide a zero degree closing angle target by utilization of anticipatory closing angle control logic for different levels of slip frequency.

II. Modbus TCP Ethernet Communication: The transfer switch controller shall provide a 100BaseT Ethernet port for customer connection to a remote data monitoring device such as PLC, building automation system or desktop PC. The Ethernet Port shall provide Modbus TCP protocol with data registers defined in the Modbus Communication Manual. The Modbus port shall provide the following main data register information:

- ATS Position Status
- ATS Source and Load Status
- Alarm status
- Utility/Generator 3 Phase Voltage
- ATS Load Bus voltage
- ATS Load Bus Power Metering (kW, kVA, kVAR, PF) when power metering option is provided).
- Event logging data

JJ. Data Logging Memory: The transfer controller shall provide data logging and shall store the data in non-volatile memory on a removable SD memory card. The following events shall be recorded and stored:

- Total Number of Transfers
- Total Number of Transfers due to source failure
- Number of Hours Controller is energized
- Number of Hours Load is on Utility
- Number of Hours Load is on Generator

KK. OPTIONAL CONTROL FEATURES

- ATS Load Bus Three Phase Power Metering: The transfer switch controller shall provide a fully integrated 3 phase power meter for the ATS Load. Current Transformers shall be provided on all phases and be rated to meet the ATS full load current. Power metering accuracy of the controller shall be +-1.5% for kW, kVAR and KVA power values. The following metering functions shall be provided
    - Killowatt (kw)
    - Kilovar (kVAR)
    - Kilovoltamperes (KVA)
    - Power Factor

- Auxiliary 24Vdc Power: An auxiliary 24Vdc power supply module shall be provided to allow external engine cranking battery supply voltage to feed the transfer switch controller for the display to be continuously powered at all times.

3 PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation Codes/Permits: Suitable permits shall be required by local authorities having jurisdiction prior to installing standby generator sets and automatic transfer switches.

B. Application: The Transfer Switch shall be Listed by Underwriters Laboratories (UL) to Safety Standard UL 1008 for Transfer Switches for Emergency Standby applications. The transfer switch shall be intended for installation and operation on legally required standby applications for emergency power systems as defined by the National Electrical Code (NEC).

C. Installation Location: The transfer switch shall be installed in an environment where the temperature range is within +5° to +122° Fahrenheit (-15° to +50° Celsius) and humidity range not exceeding 5%-95% non-condensing. The transfer switch shall <u>not</u> be installed in a location where it is subjected to direct sunlight on the front of the transfer switch door. In these applications, an optionally available sun-shade kit shall be installed.

D. Power Cabling: All power cabling entering/exiting the transfer switch enclosure shall be installed in suitably sized conduit per NEC/CEC requirements. Ampacity, type and voltage rating of all power conductors shall also comply with NEC/CEC requirements and local authorities having jurisdiction. To ensure satisfactory installation of this equipment, all power cabling connections shall utilize approved lugs and shall be adequately torqued as specified by the ATS manufacturer. All mechanical and electrical connections shall be checked for tightness prior to placing this equipment in service to ensure proper operation and to validate applicable warranty coverage.

E. Control Wiring: All control wiring for engine start, load shed, alarm and remote test shall be installed in separate conduits from all power cabling and shall be suitably sized conduits per NEC/CEC requirements. All control wiring shall be sized for minimum #18 AWG. Control wiring type and voltage rating shall also comply with NEC/CEC requirements and local authorities having jurisdiction. All field wiring/communication cabling that maybe field installed directly onto any ATS door mounted components shall be suitably routed and protected across the door hinge to prevent possible mechanical damage upon door opening and/or door closing.

F. Generator Set Automatic Starting: The transfer switch shall operate in conjunction with any generator set with remote automatic starting capabilities utilizing a 2 wire, remote start control contact input. A dry contact shall be provided for remote generator starting control (contact shall close to start generator and shall opens to stop generator).

G. Load Types: The ATS shall be connected to loads for control of motors, electric discharge lamps, tungsten filament lamps, and electric heating equipment where the sum of motor full-load ampere ratings and the ampere ratings of other loads do not exceed the ampere rating of the switch and the tungsten load does not exceed 30 percent of the switch rating.

H. Upstream Overcurrent Protection: Non-Service Entrance Rated transfer switch models do not contain any integral over current protection and shall require upstream over current protection devices for both Utility and Generator sources.

I. Upstream Overcurrent Protection: Service Entrance rated transfer switch models contain integral over current protection for the Utility source as standard. Service Entrance rated transfer switches do not

contain any integral over current protection for the generator source and shall require upstream generator source over current protection. The Service Entrance rated transfer switch shall be rated for 80% maximum continuous loading of load types.

J. Withstand/Interrupting Current Ratings: Refer to transfer switch manufactures published electrical ratings for withstand/Interrupting current ratings.

K. Integral Over current Protection: For models of transfer switch with integral over current protection, the over current protection shall be set prior to operation. The equipment shall be supplied from the ATS manufacturer with a long-time current setting of 100% (of the equipment rating) and maximum short-time/instantaneous current and time delay settings.

L. For transfer switches equipped with multi-voltage capability, the installer shall configure the ATS for the correct operating voltage on all transformer taps and shall program the transfer switch controller as required.

M. All changes to the factory default setting changes shall be recorded by the installer on a blank calibration label supplied with the transfer switch.

N. Remote Start Contact Field Wiring: As a minimum, the remote engine start control field wiring shall conform to the local regulatory authority on electrical installations. Field wiring of a remote start contact from a transfer switch to a control panel shall conform to the following additional guidelines to avoid possible controller malfunction and/or damage:

- Minimum #14 AWG ($2.5mm^2$) wire size shall be used for distances up to 100ft (30m)[1]).
- Remote start contact wires shall be run in a separate conduit.
- Avoid wiring near AC power cables to prevent pick-up of induced voltages.
- An interposing relay shall be required if field-wiring distance is excessively long (i.e. greater than 100 feet (30m)) and/or if a remote contact has a resistance of greater than 5.0 ohms.
- The remote start contact shall be voltage free (i.e. dry contact).

O. Dielectric Testing: All high voltage dielectric testing on the transfer switch shall be performed with the transfer switch controller isolated from the test source.

P. Seismic Anchoring: The transfer switch shall be installed per the anchoring details provided for seismic qualification by the ATS manufacturer. The following anchoring guidelines shall be adhered to:

- Anchoring shall be designed according to IBC 2012 or latest version.
- If wall anchors are utilized in concrete, applicable concrete type concrete anchors shall be used.
- If expansion anchors are utilized, they shall be installed according to manufacturer's recommendation.

3.2 FACTORY TESTING

The automatic transfer switch shall be factory tested prior to delivery to the purchaser. The following tests shall be conducted by qualified factory personnel:

A. Visual Inspection: Electrical and Mechanical inspections to verify installed components are of correct ratings; meet the requirements of the project specifications and to ensure regulatory and quality requirements are met.

B. Mechanical Tests: As a minimum, the following mechanical tests shall be performed on the transfer switch:

- Power Conductor Torque Verification
- Verification of Mechanical Interlock
- Manual ATS Mechanism Operation/Adjustment
- All Mechanical Fasteners/Wire Connections Tight

C. Electrical Tests: As a minimum, the following electrical tests shall be performed on the transfer switch:

- Adjustment/Setting All Timers & Voltage Sensors
- Verification of Electrical Interlock
- Function Test-Normal Operation-3 Complete Cycles
- Mechanism Adjustment
- Dielectric Test

D. Final Inspection: As a minimum, the following final inspection tasks shall be performed on the transfer switch:

- Calibration Label/Equipment labels Installed & Correct
- All safety/warning labels attached
- All wiring straight, neatly bundled and adequately protected.
- All options supplied as specified
- Enclosure is clean, no paint imperfections
- Final Documentation is Enclosed (Drawing, O&M Manual)

E. The transfer switch manufacturer shall provide upon request of the project engineer, four (4) copies of certified Factory Test Reports for the transfer switch supplied.

3.3 FIELD TESTING/COMMISSIONING

The automatic transfer switch shall be tested once installed at the project site to confirm proper operation of the system. Schedule and witness testing activities shall be coordinated with the project engineer, site contractor, and owner as required in advance of the testing. Qualified local factory-trained field service representatives shall conduct the following tests:

A. Visual Inspection: Electrical and Mechanical inspection to verify the installation is correct as recommended by the transfer switch manufacturer and as per NEC/CEC requirements.

B. Mechanical Tests: As a minimum, the following mechanical tests shall be performed on the transfer switch:

- Power Conductor Torque Verification
- Verification of Mechanical Interlock
- Manual ATS Mechanism Operation
- All Mechanical Fasteners/Wire Connections Tight
- Confirmation of correct transfer switch voltage, current and withstand ratings as is required for the application.

C. Electrical Tests: As a minimum, the following electrical tests shall be performed on the transfer switch:

- Meggar Testing the Power Cabling to the transfer switch
- Verification of correct power cabling phasing and phase rotation, prior to energization.
- Confirmation of settings for all Timers & Voltage Sensors
- Full Function Test-Normal Operation-3 Complete Cycles of failing the utility supply, and transfer load to/from the generator set.
- Verification of all Closed Transition operation modes (i.e. Fast transfer or Soft-Load Transfer as applicable)
- Verification of all Test Modes operate correctly

D. Qualified factory-trained field service personnel shall provide upon request of the project engineer four (4) copies of field test reports noting any deficiencies that require corrective action.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged engine-generator sets suitable for use in mission critical applications with the features as specified and indicated. Engine generators will be used as the Standby power source for the system, but shall be capable of providing reliable power with no run-time limitations while the primary source of power is unavailable.

1.3 DEFINITIONS

A. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the ESP unless otherwise agreed by the RIC engine manufacturer.

B. Prime Power (PRP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 70 percent of the PRP unless otherwise agreed by the RIC engine manufacturer.

C. Limited Time running Power (LTP): Per ISO 8528: The maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers.

D. Continuous Operating Power (COP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer.

E. Data Center Continuous (DCC): The maximum power which a generating set is capable of delivering continuously whilst supplying a variable or constant electrical load when operated for an unlimited number of hours in a data center application under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer. The permissible average power output (Ppp) over 24 hours of operation shall not exceed 100 percent of the DCC rating.

F. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.

2. Time-current characteristic curves for generator protective device.

3. Sound test data, based on a free field requirement.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.

2. Wiring Diagrams: Control interconnection, Customer connections.

C. Certifications:

1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary emergency application.

1.5 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

1. Certified summary of prototype-unit test report. See requirements in Part 2 "Source Quality Control" Article Part A. Include statement indicating torsional compatibility of components.

2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.

3. List of factory tests to be performed on units to be shipped for this Project.

4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

B. Warranty:

1. Submit manufacturer’s warranty statement to be provided for this Project.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 300 of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).

E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).

F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level 1 emergency power supply system.

G. Comply with UL 2200.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: -17.78 deg C (0.0 deg F) to 35.0 deg C (95.0 deg F).
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 4850.0 feet (1478.0 m).

1.8 WARRANTY

A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The basis for this specification is Cummins Power Generation equipment, approved equals may be considered if equipment performance is shown to meet the requirements herein.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

C. Capacities and Characteristics:

1. Power Output Ratings: Electrical output power rating for Standby operation of not less than 1250.0kW, at 80 percent lagging power factor, 277/480, Series Wye, Three phase, 4 -wire, 60 hertz.
2. Alternator shall be capable of accepting maximum 5521.0 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 12 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 2 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.
3. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

5. Transient Frequency Performance: Not more than 4 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 2 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.

6. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.

8. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.

9. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

10. Load Sharing: Engine generator shall share real and reactive load proportionally within plus or minus 3 percent with all other engine generators in the system.

2.3 ENGINE

A. Fuel: ASTM D975 #2 Diesel Fuel

B. Rated Engine Speed: 1800RPM.

C. Lubrication System: The following items are mounted on engine or skid:

1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.

2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.

3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions

E. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.

1. Designed for operation on a single 120 VAC, Single phase, 60Hz power connection. Heater voltage shall be shown on the project drawings.

2. Installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss.

3. Provided with a 24VDC thermostat, installed at the engine thermostat housing

G. Governor: Adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying

engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

H. Cooling System: Closed loop, liquid cooled

1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C.

2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.

4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.

5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.

I. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. For generator sets with outdoor enclosures the silencer shall be inside the enclosure.

J. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.

K. Starting System: 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.

2. Cranking Cycle: As required by NFPA 110 for level 1 systems.

3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.

4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.

5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

6. Battery Chargers: Unit shall comply with UL 1236, provide fully regulated, constant voltage, current limited, battery charger for each battery bank. It will include the following features:

a. Operation: Equalizing-charging rate based on generator set manufacturer’s recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

d. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

e. Provide LED indication of general charger condition, including charging, faults, and modes. Provide a LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.

f. Enclosure and Mounting: NEMA, Type 1, wall-mounted cabinet.

2.4 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Sub Base-Mounted Fuel Oil Tank: Provide a double wall secondary containment type sub base fuel storage tank. The tank shall be constructed of corrosion resistant steel and shall be UL 142 listed and labeled. The fuel tank shall include the following features:

1. Capacity: Fuel for 24 Hour(s) continuous operation at 100 percent rated power output.
2. Tank rails and lifting eyes shall be rated for the full dry weight of the tank, genset, and enclosure.
3. Electrical stub up(s)
4. Normal & emergency vents
5. Lockable fuel fill
6. Mechanical fuel level gauge
7. High and low level switches to indicate fuel level
8. Leak detector switch
9. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.
10. Fill port with overfill prevention valve (OFPV)
11. 5 gallon fill/spill dam or bucket
12. Tank design shall meet the regional requirements for the Project location

2.5 CONTROL AND MONITORING

A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit.

B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is

running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.

E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:

1. AC voltmeter (3-phase, line to line and line to neutral values).
2. AC ammeter (3-phases).
3. AC frequency meter.
4. AC kW output (total and for each phase). Display shall indicate power flow direction.
5. AC kVA output (total and for each phase). Display shall indicate power flow direction.
6. AC Power factor (total and for each phase). Display shall indicate leading or lagging condition.
7. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
8. Emergency Stop Switch: Switch shall be a red “mushroom head” pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
9. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
10. DC voltmeter (alternator battery charging).
11. Engine-coolant temperature gauge.
12. Engine lubricating-oil pressure gauge.
13. Running-time meter.
14. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.) The voltage and frequency adjustment functions shall be disabled when the paralleling breaker is closed.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. AC Protective Equipment: The control system shall include over/under voltage, reverse kVAR, reverse kW, over load (kW) short circuit, over current, loss of voltage reference, and over excitation shut down protection. There shall be a ground fault alarm for generator sets rated over 1000 amps, overload warning, and overcurrent warning alarm.

18. Status LED indicating lamps to indicate remote start signal present at the control, existing shutdown condition, existing alarm condition, not in auto, and generator set running.

19. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.

20. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.

21. Data Logging: The control system shall log the latest 20 different alarm and shut down conditions, the total number of times each alarm or shutdown has occurred, and the date and time the latest of these shutdown and fault conditions occurred.

22. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).

23. Paralleling Breaker control switches: The control shall include manual open and close provisions for the paralleling breaker, and LED status lamps indicating whether the breaker is open or closed.

F. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:

1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.

2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm conditions when the current flow is in excess of 110% of rated current for more than 10 seconds.

3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.

4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.

5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.

6. The protective system provided shall not include an instantaneous trip function.

B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H

D. Temperature Rise: 125 / Class H environment.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.

G. Enclosure: Drip-proof.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, 3-phase true RMS sensing, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.

I. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding. Alternators operating at voltage higher than 690VAC shall be provided with form-wound stator coils.

J. Subtransient Reactance: 12 percent maximum, based on the rating of the engine generator set.

2.8 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Sound Attenuated Steel housing. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Instruments, control, and battery system shall be mounted within enclosure.

B. Construction:

1. Louvers: Equipped with bird screen to permit air circulation when engine is not running while excluding birds and rodents.

2. Hinged Doors: With padlocking provisions. Restraint/Hold back hardware to prevent door to keep door open at 180 degrees during maintenance. Rain lips over all doors.

3. Exhaust System:

a. Muffler Location: Within enclosure.

4. Hardware: All hardware and hinges shall be stainless steel.

5. Mounting Base: Suitable for mounting on sub-base fuel tank or housekeeping pad.

6. A weather protective enclosure shall be provided which allows the generator set to operate at full rated load with a static pressure drop equal to or less than 0.5 inches of water.

C. Engine Cooling Airflow through Enclosure: Housing shall provide ample airflow for engine generator operation at rated load in an ambient temperature of 40 deg C.

1. Louvers: Fixed-engine, cooling-air inlet and discharge.

D. Sound Performance: Reduce the sound level of the engine generator while operating at full rated load to a maximum of 75 dBA measured at any location 7 m from the engine generator in a free field environment.

2.9 VIBRATION ISOLATION DEVICES

A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

1. IBC Compliance: Isolators complying with IBC requirements shall be specified in the equipment documentation, as well as the installation requirements for the unit.

2.10 FINISHES

A. Indoor and Outdoor Enclosures and Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer's standard color or as directed on the drawings.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.

2. Full load run.

3. Maximum power.

4. Voltage regulation.

5. Steady-state governing.

6. Single-step load pickup.

7. Simulated safety shutdowns.

8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.

B. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

D. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

E. Equipment shall be initially started and operated by representatives of the manufacturer. All protective settings shall be adjusted as instructed by the consulting engineer.

F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

G. On completion of the installation by the electrical contractor, the generator set supplier shall conduct a site evaluation to verify that the equipment is installed per manufacturer's recommended practice.

3.2 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests. The generator set manufacturer shall provide a site test specification covering the entire system. Tests shall include:

B. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.

C. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.4 SERVICE AND SUPPORT

A. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The inventory shall have a commercial value of $3 million or more. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including engines, alternators, control systems, paralleling electronics, and power transfer equipment.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 300 of the site.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

END OF SECTION

SECTION 40 61 13 – PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. General requirements which apply to all Instrumentation and Control for Process Systems (hereafter referred to as I&C).

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The Contractor and its Subcontractors are responsible to review all parts of the Contract Documents to provide a complete and coordinated project.

C. Complete I&C System

1. The requirements for the I&C System shall be the responsibility of a single company hereafter referred to as the Instrumentation Supplier (IS). The IS shall be responsible for all parts of this Section and Sub-Sections as well as all other related sections that may pertain to the I&C System.
2. The Contractor, through the IS and qualified electrical and mechanical installers, shall be responsible to the Owner for the implementation of a complete I&C System. The IS shall provide all necessary coordination, material, and labor such that the entire system be complete and functional. This includes but is not limited to the proper operation and monitoring of electrical power systems, process systems, mechanical equipment, instrumentation, control panels, programmable controllers, communications/networking, and SCADA system.
3. The overall I&C system design is based upon non-certified information that has been furnished by various equipment manufacturers and vendors. It is the Contractor's responsibility to include in the bid and installation all labor and material to provide a complete system based upon actual information from equipment being supplied for the project. Any changes or additions due to non-certified manufacturer or vendor information shall be provided at no additional cost to the Owner.

1.2 REFERENCES

A. The installation and commissioning of the I&C System shall conform to all applicable codes, regulations, standards, and specifications, including, but not limited to those listed below. These publications are referenced to by designation but not by edition. The latest edition accepted by the Authority Having Jurisdiction in effect at the time of bid shall govern.

1. State and Local Codes and Authority Having Jurisdiction (AHJ)
2. American National Standards Institute (ANSI)
3. American Petroleum Institute (API)

4. Federal Communications Commission (FCC)
5. Federal Occupational Safety and Health Act (OSHA)
6. International Society of Automation (ISA)
7. Institute of Electrical and Electronic Engineers (IEEE)
8. National Electric Code (NEC).
9. National Electrical Manufacturers Association (NEMA)
10. National Fire Protection Association (NFPA)
11. Underwriters Laboratories, Inc. (UL)

1.3 DEFINITIONS

A. The following definitions may be used throughout this section and subsections (refer to the contract drawings sheet GI-1 for instrumentation abbreviations):

1. CTC: Communications termination cabinet.
2. FAT: Factory acceptance test.
3. HMI: Human machine interface.
4. I&C: Instrumentation and control for process systems
5. IS: Instrumentation supplier.
6. LAN: Local area network.
7. LCP: Local control panel.
8. NC: Normally closed.
9. NO: Normally open.
10. OIT: Operator interface terminal.
11. OSI: Owner's System Integrator.
12. PC: Personal computer.
13. PID: Control action, proportional plus integral plus derivative.
14. PLC: Programmable logic controller.
15. P&ID: Process and instrumentation diagram
16. RIO: Remote input/output
17. SCADA: Supervisory control and data acquisition.
18. SI: System Integrator.
19. UPS: Uninterruptible power supply.
20. VCP: Vendor control panel.
21. WAN: Wide area network

1.4 I&C SYSTEM REQUIREMENTS

A. Work provided outside of Contractor's scope:
   1. The following equipment is being furnished by the Owner:
      a. SCADA Equipment
      b. CTC-PB Communications Cabinet
      c. PLC-PB Control Panel
      d. PLC-HW Control Panel

B. The Work is to provide a complete and operational I&C System as described by the Contract Documents. This includes but is not limited to the following:

1. Before providing a bid as the IS, coordinate with all bidders such that all costs associated with a complete I&C System are accounted for. The Owner shall not be responsible for any additional costs for scope items that have been excluded from the bid because of not coordinating with all bidders.

2. The IS shall submit a statement of qualifications verifying that it meets the requirements of 406113.1.8. The IS must be approved by the Engineer before proceeding with the Work.

3. In order to provide a complete system, oversee and coordinate with all equipment and services being provided outside of Contractor's scope.
   a. The Engineer is responsible to ensure that equipment being supplied by others related to the I&C System complies with the requirements of the Contract Documents
   b. The Contractor and IS are responsible to coordinate the installation, commissioning and scheduling of equipment related to the I&C System that are provided by others.

4. Oversee and coordinate with all equipment and services being provided by the Contractor but outside of the IS's scope.
   a. Inform all vendors and suppliers providing equipment related to the I&C System the requirements of Division 40.
   b. The Owner is not responsible for any additional costs incurred by requiring vendors and/or subcontractors to meet the requirements of Division 40.
   c. If a vendor or supplier is unable to meet the requirements of Division 40, the Contractor may submit in writing to the Engineer the reasons for non-compliance. The Engineer will then evaluate the reasons and determine whether a solution may be determined or if a different vendor or supplier is required.
   d. The Contractor and IS are responsible for coordinating with vendors and suppliers the FAT, installation, commissioning, calibration, and scheduling for the associated I&C equipment.
   e. The IS is responsible to ensure that panel and loop drawings be supplied for vendor and subcontractor equipment. If the vendors and/or subcontractors are preparing the panel and/or loop drawings, they shall comply with the requirements of Division 40 and shall match those provided by the IS.

5. The IS shall conduct a Pre-Submittal Conference before producing any submittals. The conference should include all parties involved with the I&C System including the Engineer and Owner. The purpose of the conference shall be to review the project, make sure all parties understand their roles and responsibilities and to go over submittal requirements.

6. Prepare I&C System Submittals which includes the following:
   a. Instrumentation hardware submittal (including TR20 forms).
   b. Recommended spare parts submittal.

7. Following submittal approvals, do the following:
   a. Procure all instrumentation hardware and accessories.
   b. Procure hardware for and fabricate all control panels being provided.
   c. Perform FAT's for all control panels being provided.

8. Programming and integration shall be supplied by the OSI. Oversee and coordinate the programming and integration with the OSI for a complete I&C System.

9. Oversee the installation of the I&C System.

10. Perform bench and field calibrations of instruments as required.

11. Oversee and document loop testing.

12. Oversee and document commissioning.

13. Maintain record drawings.
    a. Maintain on the construction site a set of the Instrumentation Drawings that shall be continuously marked up during construction.
    b. The drawings should be updated at least weekly and will be checked monthly by the Owner's representative.
    c. Upon completion of startup, submit the marked-up drawings to the Engineer for review and for drafting.

14. Prepare O&M manuals.
    a. Provide O&M manuals in accordance with Section 017823.
    b. Prepare an O&M manual for each major process area or building. Each of these manuals shall be divided into the following categories:
        1) Table of Contents/Index.
        2) Process & Instrumentation Diagrams
        3) Control Panel Record Drawings, Bill of Materials and Design Data.
        4) Record Loop Drawings
    c. Prepare O&M manuals that cover comprehensive information for the I&C System. These manuals shall include the following:
        1) Table of Contents/Index.
        2) Finalized Instrument Summary
        3) Finalized TR20 Instrument Forms
        4) Instrumentation Installation Details
        5) Instrument Operational Manuals
        6) Recommended Spare Parts List

15. Provide training.

1.5 ACTION SUBMITTALS

A. General
1. Submittals for Division 40 shall meet the requirements of Section 01 33 00 Contractor Submittals. In addition, the following requirements shall be met:
    a. Submittals shall include bills of materials with quantities, makes, models, exact part numbers and descriptions.
    b. Edit all submittals such that only pertinent information is submitted. Neatly cross out information that does not apply, options that are not being supplied, etc.
    c. Show product dimensions, construction, and installation details, wiring diagrams, and specifications.
    d. If there are exceptions to the Contract Drawings and Specifications, provide a list of exceptions with detailed explanations for the exceptions. The Engineer will review the list of exceptions and determine whether a solution may be determined or if the exception(s) will not be allowed.

2. Furnish submittal required by each Section within Division 40.
3. When submitting on equipment, use the equipment and instrumentation tags depicted in the Contract Drawings.

B. Instrumentation hardware submittal
1. Provide a comprehensive submittal that includes all instrumentation being supplied by the IS. Divide the submittal into the following:
   a. Table of Contents/Index.
   b. Instrument summary.
   c. Instrument TR20 Forms.
   d. Instrument Cut Sheets.
   e. Instrument Installation Drawings.
2. Provide an instrument summary (sorted by tag number) that has the following information:
   a. Tag number.
   b. Make, model and description.
   c. Associated process.
   d. Location.
   e. Calibrated range.
   f. Referenced loop drawing number and P&ID.
   g. Associated PLC.
3. Furnish TR20 instrumentation forms for each instrument using the forms outlined in ISA-TR20.00.01-2007. This requirement includes all instruments that are being installed as part of the project, whether they are Contractor, Owner and/or Vendor supplied. Show on each sheet who is the responsible party for supplying the instrument. The TR20 sheets should be provided electronically in Microsoft Word or Excel as well.
4. Provide instrument cut sheets for each instrument make and model being supplied for the project. Each cut sheet should have a list of instrument tag numbers that pertain to that cut sheet. The cut sheets should have enough information to verify that the instrument conforms to the Contract Drawings and Specifications.
5. Instrument installation drawings
   a. Provide instrument installation drawings for each make and model of instrument being supplied.
   b. Delineate what is being supplied by the IS and what is being supplied by other installers.
   c. Show overall dimensions, mounting locations and elevations.
   d. Show all cabling, conduit and piping locations.
   e. Show the ambient conditions of the location where the instrument is being installed which includes ambient temperature and humidity extremes, whether the atmosphere is corrosive and the area classification.
   f. Show mounting requirements, brackets, stands and anchoring.
   g. Show means for sun protection where required.

C. Recommended Spare Parts Submittal
1. Submit a list of spare parts for all the equipment associated with the I&C System. The list of spare parts shall include list pricing for each item.
2. Provide the name, address and phone number for each manufacturer and manufacturer's local sales representative.
3. Indicate whether the spare parts are being provided under this contract or not.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Calibration certificates.

C. As-built TR20 forms.

1.7 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.8 QUALITY ASSURANCE

A. All equipment supplied for this project shall meet the requirements of the National Electric Code (NEC) and shall be listed by and bearing the label of the Underwriters' Laboratories (UL).

B. The IS shall be a company that has been actively involved in the installation and commissioning of I&C Systems for a minimum period of five years.

C. The IS shall have adequate facilities, manpower and technical expertise to perform the Work associated with the I&C System and as outlined by the Contract Documents.

D. The IS shall have similar project experience of at least four successfully completed projects for a similar wastewater system. The IS company must have performed similar work for these projects as required herein.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials provided under this Contract shall be new and free from defects.

2.2 MANUFACTURERS

A. All equipment provided for the I&C System shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

B. Instruments which utilize a common measurement principle (for example, float switches) shall be furnished by a single manufacturer. Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

2.3 OPERATING CONDITIONS

A. The I&C System shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
   1. Environment: Wastewater Treatment Plant.
   2. Temperature Extremes: -4°F to 104°F (Outdoors); 40°F to 104°F (Indoors).
   3. Relative Humidity: 20% to 90%, non-condensing.

B. Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided to maintain instrumentation devices 20 percent within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. Instrumentation in hazardous areas shall be suitable for use in the hazardous or classified location in which it is to be installed.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE AND HANDLING

A. After completion of shop assembly, factory test, and approval, equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the Site.

B. Special instructions for proper field handling, storage, and installation required by the manufacturer shall be securely attached to each piece of equipment prior to packaging and shipment.

C. Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the PCIS. Identification shall be prominently displayed on the outside of the package.

D. Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the Contractor. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through tests as directed by the Engineer. If such tests reveal defects, the equipment shall be replaced.

3.2 MANUFACTURER'S SERVICES

A. Manufacturer's services shall be furnished for the following equipment:

1. Vendor supplied equipment that contain programmable controllers, operator interfaces and/or instrumentation that requires site calibration.

B. The Contractor shall furnish the following manufacturer's services for the instrumentation listed below:
   1. Perform bench calibration.
   2. Oversee installation.
   3. Verify installation of installed instruments.
   4. Certify installation and reconfirm manufacturer's accuracy statement.
   5. Oversee loop testing and pre-commissioning
   6. Train the Owner's personnel.

3.3 INSTALLATION

A. Instrumentation shall be installed per the Instrument Installation Drawings that have been submitted and approved and per the requirements of Division 40. This includes all instrumentation for the I&C System, regardless of who the supplier is. Instrumentation shall be mounted so that it is easily accessible and viewable and such that it does not restrict access to other equipment. Mount instrumentation to pipe stands or wall mounts if they are not directly mounted or if the Contract Drawings indicate otherwise.

B. The I&C System indicated throughout the design are diagrammatic and therefore locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the Contractor shall make such changes without additional cost to the Owner.

C. The I&C System is integrally connected to electrical, mechanical, and structural systems. Coordinate with these other disciplines the installation of these related components. All conduit, cables and field wiring shall be as required by Division 26.

D. Instruments, control panels and all other I&C System related equipment shall be anchored by methods that comply with seismic requirements applicable to the Site.

E. Each existing instrument to be removed and reinstalled shall be cleaned, reconditioned, and recalibrated by an authorized service facility of the instrument manufacturer. The Contractor shall provide certification of this Work prior to reinstallation of each instrument.

F. The Contract Documents show necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such additions and such changes, including the proposed method of installation, shall be submitted to the Engineer for approval prior to commencing that Work. Such changes shall not be a basis of claims for extra Work or delay.

G. Instrumentation, control panels, wiring and all other I&C equipment shall be properly tagged and/or labeled per the requirements of Division 26.

H. Installation of the I&C System shall be according to the finalized Loop Drawings

3.4 TRAINING

A. Develop a Training Plan for the training requirements of Division 40 and submit it to the Engineer for approval. Coordinate with the Engineer and Owner the time and locations of each training session. Schedule the trainings for after the equipment has been pre-commissioned.

B. As part of the Training Plan, submit a résumé for everyone to be providing training. Training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.

C. Each training session shall include a written agenda.

D. The Contractor shall train the Owner's personnel on the maintenance, calibration and repair of instruments provided.

E. Within 10 days after the completion of each session, the Contractor shall submit the following:
   1. A list of Owner personnel who attended the training.
   2. A copy of the training materials used during the session with notes, diagrams, and comments.

END OF SECTION 40 61 13

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SECTION 40 61 21 – PROCESS CONTROL SYSTEM TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes in-factory and field-testing requirements.

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The Contractor and its Subcontractors are responsible to review all parts of the Contract Documents to provide a complete and coordinated project.

C. Complete I&C System

1. The requirements for the I&C System shall be the responsibility of a single company hereafter referred to as the Instrumentation Supplier (IS). The IS shall be responsible for all parts of this Section and Sub-Sections as well as all other related sections that may pertain to the I&C System.
2. The Contractor, through the IS and qualified electrical and mechanical installers, shall be responsible to the Owner for the implementation of a complete I&C System. The IS shall provide all necessary coordination, material, and labor such that the entire system be complete and functional. This includes but is not limited to the proper operation and monitoring of electrical power systems, process systems, mechanical equipment, instrumentation, control panels, programmable controllers, communications/networking, and SCADA system.
3. The overall I&C system design is based upon non-certified information that has been furnished by various equipment manufacturers and vendors. It is the Contractor's responsibility to include in the bid and installation all labor and material to provide a complete system based upon actual information from equipment being supplied for the project. Any changes or additions due to non-certified manufacturer or vendor information shall be provided at no additional cost to the Owner.

1.2 SUBMITTALS

A. In addition to the submittal requirements of Section 40 61 13, provide the following:

1. Test Results:
   a. Pass/fail status of all digital I/O.
   b. Results of analog I/O testing.
2. Miscellaneous:
   a. Detailed step-by-step in-factory and field test procedure at least 6 weeks in advance of scheduled test date. Include sign-off sheets and punch list forms and description of configurations to be tested.

b. Complete inventory of equipment to be tested at factory including make, model, and serial number. Label each piece of equipment.
c. Preventative maintenance schedule.

3. Submit in accordance with 01 33 00.

PART 2 - SERVICES

2.1 MANUFACTURER'S SERVICES

A. Manufacturer's services shall be furnished for the following equipment:
1. Vendor supplied equipment that contain programmable controllers, operator interfaces and/or instrumentation that requires site calibration.

B. The Contractor shall furnish the following manufacturer's services for the instrumentation listed below:
1. Perform bench calibration.
2. Oversee installation.
3. Verify installation of installed instruments.
4. Certify installation and reconfirm manufacturer's accuracy statement.
5. Oversee loop testing and pre-commissioning
6. Train the Owner's personnel.

2.2 FACTORY ACCEPTANCE TESTING (FAT)

A. The IS shall arrange for the manufacturers of the equipment and fabricators of panels and cabinets supplied under this Section to allow the Engineer and Owner to inspect and witness the testing of the equipment at the site of fabrication. Equipment shall include the cabinets, special control systems, and other pertinent systems and devices. A minimum of 10 days notification shall be furnished to the Engineer prior to testing. No shipments shall be made without the Engineer's approval.

B. For each FAT, the IS shall develop and submit a FAT Plan and Procedure Document within 10 days of the FAT. The FAT Plan and Procedure shall as a minimum shall have the following:
1. Descriptions of test methods to be performed during the FAT.
2. FAT Schedule and Procedure
3. FAT Checklists that allow for sign-off and comments for each test method and procedure.

C. Control Panel Completion Test Methods: The following test methods should be performed during the FAT for each control panel:
1. Completed Shop Drawings: Demonstrate that the control panel has been built according to the shop drawings and that the shop drawings are accurate.
2. Panel Layout: Demonstrate that the control panel has been laid out as designed and as required by Division 40.
3. Power Distribution: Demonstrate all power distribution circuits, including but not limited to AC power circuits, UPS operation, signals and circuits and DC circuits.
4. Control Circuits: Demonstrate the correct installation of each control circuit. Using a signal generator or multi-meter, show the correct operation of each input, output, relay,

barrier, buttons, switches, or any other control device. Demonstrate the proper functionality of any hard-wired interlocks that may be associated with each control circuit.

5. Panel Networking/Communications: If any form of communications is associated with the control panel, verify the proper operation of each communication port and link.

D. Control Loop Test Methods: To demonstrate that the control panel will provide its function as intended, provide the following control loop test methods. If programming for the control panel is provided by others, coordinate with the programmer to have all programming completed and tested prior to the FAT. If needed, coordinate to have the programmer present for the FAT.

1. Alarm Functions: Verify and/or simulate each alarm condition associated with each control loop.
2. Local Manual and Auto Functions: Verify and/or simulate each Local Manual and/or Auto function associated with each control loop.
3. SCADA Manual and Auto Functions: Verify and/or simulate each SCADA Manual and/or Auto function associated with each control loop.
4. Control Loop Interlocks: Demonstrate the functionality of any software interlocks that may be associated with each control loop.

E. If the FAT does not pass and needs to be repeated, the IS shall be responsible for additional per diem costs incurred by the Engineer and Owner.

F. All changes and/or corrections made during the FAT shall be noted on the checklists.

G. Following completion and approval of all FAT, provide the finalized checklists to the Engineer and as part of the equipment shop drawings.

2.3 FIELD QUALITY CONTROL

A. Allow for inspections by the Engineer and/or Owner of the I&C System at any time during the construction. Inspections shall be conducted to verify that the installation is per the requirements of the Contract Documents.

2.4 CALIBRATION

A. Devices provided under Division 40 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Each instrument shall be calibrated at 0, 25, 50, 75, and 100 percent of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards and Testing.

C. Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations need adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.

D. Instruments which were not bench-calibrated shall be calibrated in the field to ensure proper operation in accordance with the instrument loop diagrams or specification data sheets.

E. Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. For each instrument calibration, provide a calibration sheet and update the corresponding TR20 Instrument Form with the new calibration data. The Calibration sheet shall include the following as a minimum:
   1. Date of calibration
   2. Project Name.
   3. Tag Number.
   4. Manufacturer, model, and serial number.
   5. Calibration data including range, input, output, and measurement at each calibration point.
   6. Space for comments.
   7. Space for sign-off by party performing calibration.

G. A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. The IS shall sign the tag when calibration is complete. The Engineer will sign the tag when the calibration and testing has been accepted.

2.5 LOOP TESTING

A. Each control loop shall have been installed according to the finalized loop drawing. Prior to the commencement of loop testing, the following pre-requisites should have been met:
   1. All associated equipment, conduit and wire has been permanently installed, terminated and inspected.
   2. All wiring has been properly pulled, terminated and labeled.
   3. Each wire has been tested with a point-to-point test.
   4. All control panels and electrical equipment have been checked out and tested as required by Division 26.
   5. All instrumentation has been appropriately installed and calibrated.
   6. Loop Test Forms for each loop to be tested have been created and will be available during the loop testing.

B. Each loop test shall have a Loop Test Form prepared and ready prior to each loop test. The loop test form shall have the following:
   1. Loop Number and Description
   2. Check-Off List with room for sign-off and dated by the IS, Programmer, and Owner's Witness as well as room for comments. The list of items to be checked off for each loop should include but is not limited to the following:
      a. Each power distribution circuit.
      b. Each control circuit.
      c. Each alarm circuit.
      d. Each PLC input/output point.
      e. Each Local Manual, Local Auto, SCADA Manual & SCADA Auto function.
      f. Each hard-wired and software interlock.

C. Upon completion of the above pre-requisites for loop testing, the IS shall oversee and coordinate each loop test. The IS is responsible to be present for all loop testing, whether the equipment was supplied by the IS or not. The IS is responsible to have all responsible parties associated with each loop present. This includes but is not limited to manufacturer representatives, vendor

technicians, electrical installers, mechanical installers, and programmer. The IS shall coordinate with the Owner and Engineer to allow for witnessing of loop testing as deemed necessary by the Owner and Engineer.

D. Issues that arise during loop testing should be addressed and fixed immediately. If it is not feasible to immediately fix the issues, the loop testing should be re-scheduled as soon as possible to avoid delays. Any costs associated with re-testing and requiring all parties to return to the site shall in no way be incurred to the Owner.

E. Following a successful loop test, the appropriate parties should sign and date the Loop Test Forms. All Forms shall be certified and submitted to the Engineer as part of the O&M Manuals.

F. Following loop testing, in no way should any parts of the loop be modified. In no way shall any wiring be re-routed or re-terminated. If any such work occurs, all affected loops shall be re-tested at no expense to the Owner.

2.6 COMMISSIONING

A. The IS shall oversee, coordinate and be present during all commissioning activities. The IS shall be responsible for obtaining the assistance of the Contractor and Subcontractors as may be required for commissioning activities.

B. Commissioning shall commence after acceptance of wire test, calibration tests and loop tests, and inspections have demonstrated that the instrumentation and control system complies with Contract requirements. Pre-commissioning shall demonstrate proper operation of every system with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.

C. Commissioning and test activities shall follow detailed test procedures and check lists accepted by the Engineer. Test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the Engineer, which include calculated tolerance limits for each step. Completion of system commissioning and test activities shall be documented by a certified report, including test forms with test data entered, delivered to the Engineer with a clear and unequivocal statement that system commissioning and test requirements have been satisfied.

D. Where feasible, system commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under startup and steady state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. Hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady state operation of final control elements running under the control of field mounted automatic analog controllers or software-based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software-based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any), and making

necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

E. Electronic control stations incorporating proportional, integral, or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed setpoint settings shall be compared to measured final control element position/speed values at 0, 25, 50, 75, and 100 percent of span and the results checked against indicated accuracy tolerances.

END OF SECTION 40 61 21

SECTION 40 61 26 – PROCESS CONTROL SYSTEMS TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Training requirements.

B. Related Sections

1. The Contract Documents are a single integrated document. As such, all Divisions and Sections are applicable. The Contractor and its Subcontractors are responsible to review all parts of the Contract Documents in order to provide a complete and coordinated project.

1.2 DEFINITIONS

A. The following definitions may be used throughout this section and subsections (refer to the contract drawings sheet GI-1 for instrumentation abbreviations):

1. CTC: Communications termination cabinet.
2. FAT: Factory acceptance test.
3. HMI: Human machine interface.
4. I&C: Instrumentation and control for process systems
5. IS: Instrumentation supplier.
6. LAN: Local area network.
7. LCP: Local control panel.
8. NC: Normally closed.
9. NO: Normally open.
10. OIT: Operator interface terminal.
11. OSI: Owner's System Integrator.
12. PC: Personal computer.
13. PID: Control action, proportional plus integral plus derivative.
14. PLC: Programmable logic controller.
15. P&ID: Process and instrumentation diagram
16. RIO: Remote input/output
17. SCADA: Supervisory control and data acquisition.
18. UPS: Uninterruptible power supply.
19. VCP: Vendor control panel.
20. WAN: Wide area network

1.3 SUBMITTALS

A. TRAINING

1. Develop a Training Plan for the training requirements of Division 40 and submit it to the Engineer for approval. Coordinate with the Engineer and Owner the time and locations of

each training session. Schedule the trainings for after the equipment has been pre-commissioned.

2. As part of the Training Plan, submit a résumé for everyone to be providing training. Training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.
3. Each training session shall include a written agenda.
4. The Contractor shall train the Owner's personnel on the maintenance, calibration and repair of instruments provided.
5. Within 10 days after the completion of each session, the Contractor shall submit the following:
6. A list of Owner personnel who attended the training.
7. A copy of the training materials used during the session with notes, diagrams and comments.

PART 2 - EXECUTION

2.1 MAINTENANCE TRAINING

A. Cover following areas as a minimum:
   1. Testing programs which can isolate faults to functional area.
   2. Theory, logic flow, physical hardware awareness, and interface connections and assembly of each equipment item.
   3. Diagnostic procedures using special and general-purpose test equipment. Theory, testing, and troubleshooting procedures given for special test equipment.
   4. Operation of computers and peripherals.
   5. Programming routines and procedures to enable students to take advantage of on-line and standby equipment for maintenance and performance verification.
   6. Present short operator's course to ensure students understand operator functions and man/machine interfaces. Explain displays and printouts so students understand how information is derived, when it is presented incorrectly, and use of guidelines to differentiate between software and hardware problems.

2.2 INSTRUMENT TRAINING

A. Cover following areas as a minimum:
   1. General principle of operation.
   2. Calibration schedule.
   3. Calibration procedure.
   4. Calibration equipment required (if needed).
   5. Recommended spare parts.
   6. Consumable part – recommended replacement schedule (e.g. Reagents, filters, probe tips) and procedure.
   7. General care and maintenance with special consideration to all instruments that may require cleaning such as pressure and level elements, etc.

2.3 HMI TRAINING

A. HMI functionality.

B. How key components work; shall include, but not be limited to:
   1. Entering of set points.
   2. Using alarm matrix.
   3. Acknowledging and clearing alarms.

END OF SECTION 40 61 26

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SECTION 40 66 33 – METALLIC AND FIBER-OPTIC COMMUNICATION CABLING AND CONNECTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structured Cabling System (SCS).
2. Communications Termination Cabinets (CTC).
3. Process Control Network Components.

B. Related Sections

1. The requirements of Division 26 shall apply to this section.

1.2 DEFINITIONS

A. The following definitions may be used throughout this section and subsections (refer to the contract drawings sheet GI-1 for instrumentation abbreviations):

1. CTC: Communications termination cabinet.
2. HMI: Human machine interface.
3. LAN: Local area network.
4. LCP: Local control panel.
5. OIT: Operator interface terminal.
6. OSP: Outside Plant.
7. PC: Personal computer.
8. PLC: Programmable logic controller.
9. SCADA: Supervisory control and data acquisition.
10. SCS: Structured Cabling System.
11. UPS: Uninterruptible power supply.
12. WAN: Wide area network.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each CTC cabinet supplied.

C. Network Drawings: Submit drawings for physical connections between all network hardware.

D. Exchange of Technical Information: During the period of these submittals, the Contractor shall authorize a direct, informal liaison with the Engineer for exchange of technical information. As a result of this liaison, certain minor refinements and revisions in the systems as indicated may

be authorized informally by the Engineer, but will not alter the scope of work or cause increase or decrease in the Contract Price. During this informal exchange, no oral statement by the Engineer shall be construed to give approval of any component or method, nor shall any statement be construed to grant exception to or variation from these Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Submit the operation and maintenance data, including record drawings as required by Section 40 61 13.

1.6 QUALITY ASSURANCE

A. Referenced Standards:

1. National Electric Code (NEC).
2. American Society for Testing and Materials (ASTM).
3. National Electrical Manufacturers Association (NEMA).
4. Underwriters Laboratories Inc. (UL).
5. Telecommunications Industry Association / Electronic Industries Association (TIA/EIA) 568B – Commercial Building Telecommunications Cabling Standards.
6. TIA/EIA 569B – Commercial Building Standard for Telecommunications Pathways and Spaces.
7. International Standards Organization/International Electrotechnical Commission (ISO/IEC) 11801 – Information Technology – Generic cabling for customer premises.
8. Institute of Electrical and Electronic Engineers (IEEE)

B. Hardware and software to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

C. Examine the Contract Documents and verify that Process Control Network equipment and software being provided is compatible with the requirements. Provide all necessary accessories for the Process Control Network for a complete and operable system.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver the Process Control Network hardware and software as a complete system and as required by Section 40 61 13.

1.8 SPECIAL WARRANTY REQUIREMENTS

A. The Contractor shall provide a Ten (10) year warranty on the following items:

1. Fiber Optic Cabling.
2. Fiber Optic Terminations and Cross-Connect Equipment.
3. Outside-Plant (OSP) Category 6 Cabling.
4. Copper Patch Panels and Indoor Category 6 Cabling.
5. CTC Hardware (excluding UPS and other electronic devices).

B. Extended Period for Correction of Defects: The Contractor shall correct all defects in the SCS upon notification from the OWNER within 2 years from the date of Substantial Completion. Corrections shall be completed within 5 days after notification.

PART 2 - PRODUCTS

2.1 GENERAL

A. Current Technology: Cabling, Hardware and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

B. Hardware Commonality: All like equipment shall be provided by a single manufacturer.

2.2 EQUIVALENT PRODUCTS

A. Equivalent products may be considered for substitution for those products specified, however, the equivalent product must be approved and show demonstrated and documented equivalence to the product specified. Documentation shall include, but is not limited to: product samples, data sheets, and actual test data. The request for product substitution and supporting documentation must be submitted in writing prior to submitting the bid. Written approval for product substitution must be submitted with the bid.

2.3 FIBER OPTIC CABLING

A. Fiber optic cabling shall be provided between facilities and furnished with the quantity of fibers as designated on the contract drawings.

B. All fiber in a cable run shall be from the same manufacturer and shall be the same type. A mix of fibers from different manufacturers may not be used without written permission.

C. Fiber optic cabling exposed to the elements shall be an armored type fiber optic cable.

D. No fiber splicing or closures are allowed except to replace existing splices.

E. Singlemode Fiber

1. All singlemode fiber optic cables within the premises shall use graded-index fibers with 9 micron cores only.
2. Optical Specifications
    a. Fibers shall have dual wavelength capability at 1310nm and 1550nm.
    b. Attenuation: ≤ 0.4 dB/km at 1310nm and 0.3 dB/km at 1550nm.
    c. Bandwidth: Operation of 10 Gigabit Ethernet at 10,000 meters at 1310nm and 30,000 meters at 1550nm.
    d. Numerical Aperture: 0.14.
3. All fibers shall be color coded to facilitate individual fiber identification. Fibers shall have CPC® or approved equivalent color coatings that resist color degradation, minimize microbending losses and improve handling. The coating shall be mechanically strippable.
4. Dimensional Specifications
    a. Core Diameter: 8.2 µm
    b. Cladding Diameter: 125.0 ± 0.7 µm
    c. Core-Clad Concentricity: ≤ 0.5 µm
    d. Cladding Non-Circularity: ≤ 0.7%
    e. Coating Diameter: 242 ± 5 µm
    f. Coating-Cladding Concentricity: < 12 µm
5. Environmental Specifications
    a. Operating Temperature: -60ºC to +85ºC
    b. Cable shall be UV resistant, waterproof and corrosion resistant.
6. Mechanical Specifications
    a. Minimum tensile strength: 100,000 psi
    b. Fiber Minimum Bending Radius: 0.75 Inches
    c. Cable Minimum Bending Radius (During Installation): 20 times cable diameter
    d. Cable Minimum Bending Radius (After Installation): 10 times cable diameter
    e. Cable shall be rated for Underground, Buried and Aerial, OSP
    f. Cable shall bear OFNP (Plenum Rated), OFNR (Riser Rated) and/or appropriate markings for the environment in which they are installed.
    g. Cable shall utilize 3.0mm buffer tubes containing up to twelve 250 µm color-coded optical fibers.
7. Fiber Cabling shall contain the number of fibers specified in the Drawings.
8. Acceptable Manufacturers
    a. Corning SMF-28e+.
    b. Or approved equal.

F. Innerduct

1. Inner duct shall be used where space is available. All new and spare 2” conduits shall use inner duct with the fiber optic cable.

G. Buffer Tube Fiber Fan-Out Kits

1. Buffer Tube Fan-Out Kits shall be supplied for the termination of each buffer tube at end of the installed fiber cables.
2. Fan-Out Kits shall be color coded to match the color scheme of the fiber cabling.
3. Fan-Out Kits shall have a minimum length of 25 inches.
4. Acceptable Manufacturers
    a. Corning FAN-BT25-12.
    b. Or Approved Equal.

H. Fiber Optic Connectors

1. Fiber Optic Connectors shall be of ceramic construction and shall have a loss ≤ 0.5 dB. They shall be made specifically for the type of fiber being connected to and required bandwidth. The connector shall have no metal parts.
2. Fiber Optic Connectors shall utilize the LC type connector.
3. Acceptable Manufacturers
   a. Corning 95 Series.
   b. Or Approved Equal.

I. Fiber Patch Cords

1. The fiber patch cord shall be duplex and consist of buffered, graded-index fiber with a 50 or 62.5 µm core for multimode and 9 µm for singlemode and a 125 µm cladding. The fiber cladding shall be covered by aramid yarn and a jacket of flame-retardant PVC.
2. The fiber patch cord shall be rated for 10 Gigabit Ethernet.
3. For 50 µm multimode the cords shall be Aqua in color.
4. For 62.5 µm multimode the cords shall be Orange in color.
5. For singlemode the cords shall be Yellow in color.

2.4 COPPER NETWORK CABLING

A. Outside Plant Cabling (OSP)

1. All building-to-building copper network cabling shall be shielded and shall be rated as outside plant (OSP), Category 6 cables.
2. The cabling shall be terminated in the CTC in each building and shall be punched down at the patch panel on the CTC. The shield shall be grounded only on one end of the cable inside the CTC.
3. Shielded OSP Category 6 Specifications
   a. Category 6 Transmission performance characterized to 500MHz.
   b. Aluminum metallic shield tape for protection against EMI/RFI
   c. Four 23 AWG solid twisted pairs
   d. UV/Sunlight resistant black jacket
   e. Acceptable Manufacturers
      1) Superior Essex BBDN6.
      2) Or Approved Equal.

B. Indoor Cabling

1. Network cabling from the CTC's to wall jacks, control panels, MCCs, phones and all other Ethernet devices shall utilize Category 6 unshielded cable. The Category 6 cable shall be rated for Plenum use if it is ran through any Plenum rated areas, otherwise it shall be rated for Riser use.
2. The following color scheme shall be utilized for indoor network cabling:
   a. Blue – Wall Jacks network connections
   b. Gray – Control Panels or MCCs
   c. Yellow – Patch Cables within the CTC
   d. Black – Outside Plant (OSP) cables
   e. Red – Security System / Fire System Cables

f. White – Wall Jack phone connections
g. Pink – Miscellaneous Ethernet devices

3. Unshielded Category 6 Specifications
   a. Category 6 Transmission performance characterized to 500MHz.
   b. Four 23 AWG solid twisted pairs
   c. Plenum rated cable shall have FEP insulation with a FRPVC jacket
   d. Riser rated cable shall have FRPE insulation with a PVC jacket.
4. Acceptable Manufacturers
   a. Superior Essex Series 77.
   b. Or Approved Equal.
5. Patch Cords
   a. Patch cords shall be TIA/EIA Category 6 Compliant. Cords shall be straight through unless cross-over is necessary. Cords shall be 24AWG stranded copper with FRPE insulation and a PVC jacket. RJ45 jack shall have contacts with 50 micro-inch gold plating and a high-impact, UL 94V-0 rated thermoplastic housing.
   b. Patch cords shall have a molded boot cover for protecting the RJ45 connector.
   c. All patch cords in the CTC shall be yellow.

2.5 CROSS-CONNECT EQUIPMENT

A. Cross-Connect Housings shall be provided by the Owner's System Integrator.

2.6 COMMUNICATIONS TERMINATION CABINETS (CTC)

A. CTC's shall be provided by the Owner's System Integrator. CTC's shall be 19" rack type systems that shall be able to support and organize electronic equipment, cross-connection and/or termination hardware for fiber optic cabling, station cabling, riser cabling, or building entrance cabling as may be required by design. The rack face shall have a conventional equipment mounting width of 19".

B. The rack must be designed for cable and jumper management and have hardware to organize and support cabling and patch cords in the vertical and horizontal planes. The rack system shall be equipped for electrical grounding to meet EIA/TIA 606 Standards. The fastening system for the equipment shall facilitate easy installation with roll-formed threads in the screw holes for greater strength and durability. The mounting screws shall have pilot points.

C. For NEMA 1 enclosures, all rack components shall be charcoal black in color and made of lightweight 6061-T6 extruded aluminum. For NEMA 4X enclosures the enclosure shall be 304SS.

D. The rack shall be shipped with all necessary hardware to assemble the included frame. It shall be packed in cartons with suitable shipping inserts such that no damage occurs to the rack finish. The finish shall not be scratched, chipped or marred.

E. Each CTC cabinet shall be supplied with a dedicated 20A, 120VAC circuit with associated receptacle mounted in the back of the cabinet.

F. Free Standing Rack Specifications

1. Self-Supported Rack Framework
    a. The self-supporting equipment rack shall be inside the CTC. Standard grade frames shall be capable of supporting equipment to be mounted inside the CTC.
    b. Dimensions: As required to fit in CTC with 19 inch center mounting and a minimum of 67" of usable vertical space. Base Footprint of 20.25" wide by 36" deep.
    c. Hole Pattern: EIA310-D 5/8" – ½" alternating.
    d. Mounting Screws: #12-24 thread combination Phillips/straight heads and pilot points.
    e. Materials: 6061-T6 high strength aluminum.
    f. Flanges: Flange edge to edge internal measurement is 17.75"
2. Racks shall be mounted inside NEMA 1 Enclosures with front and rear access doors.
3. Enclosures shall have glass front doors and solid vented rear doors.
4. Approved ground lug and #6 AWG jacketed green ground wire.
5. CTC shall be installed with at least 36" clear working space in front and behind cabinet.
6. Minimum 72" tall free standing enclosures.
7. Equipped with a slide-out shelf suitable for a laptop computer to be placed on it for system configuration/programming. The shelf shall be vented.
8. Equipped with a vertical power strip installed with a minimum of 10 outlets rated at 15 amps. The vertical power strip shall be surge protected.
9. Approved Manufacturers
    a. Great Lakes.
    b. Rittal.
    c. CPI.
    d. Or Approved Equal.

G. NEMA 1 Wall Mount Rack Specifications

1. Self-Supported Rack Framework
    a. The self-supporting equipment rack shall be inside the CTC. Standard grade frames shall be capable of supporting equipment to be mounted inside the CTC.
    b. Dimensions: As required to fit in CTC with 19 inch center mounting. Base Footprint of 20.25" wide by 24" deep.
    c. Hole Pattern: EIA310-D 5/8" – ½" alternating.
    d. Mounting Screws: #12-24 thread combination Phillips/straight heads and pilot points.
    e. Materials: 6061-T6 high strength aluminum.
    f. Flanges: Flange edge to edge internal measurement is 17.75"
2. Racks shall be mounted inside NEMA 1 Wall Mount Enclosures with a double hinge system allowing front and rear access.
3. Enclosures shall have glass or plexiglass front doors and solid vented rear doors.
4. Approved ground lug and #6 AWG jacketed green ground wire.
5. CTC shall be installed with at least 36" clear working space in front and 36" on the hinge side of the cabinet to allow access to the rear.
6. Panel mounting height shall be such that the top of the wall mount CTC does not exceed 80" above the finished floor.
7. Approved Manufacturers
    a. Great Lakes.
    b. Rittal.
    c. CPI.
    d. Or Approved Equal.

H. NEMA 4X Wall Mount Rack Specifications

1. Self-Supported Rack Framework
   a. The self-supporting equipment rack shall be inside the CTC. Standard grade frames shall be capable of supporting equipment to be mounted inside the CTC.
   b. Dimensions: As required to fit in CTC with 19 inch center mounting. Base Footprint of 20.25" wide by 24" deep.
   c. Hole Pattern: EIA310-D 5/8" – ½" alternating.
   d. Mounting Screws: #12-24 thread combination Phillips/straight heads and pilot points.
   e. Materials: 6061-T6 high strength aluminum.
   f. Flanges: Flange edge to edge internal measurement is 17.75"
2. Racks shall be mounted inside NEMA 4X Wall Mount Enclosures with a double hinge system allowing front and rear access.
3. Enclosures shall have glass or plexiglass front doors and solid vented rear doors.
4. Approved ground lug and #6 AWG jacketed green ground wire.
5. CTC shall be installed with at least 36" clear working space in front and 36" on the hinge side of the cabinet to allow access to the rear.
6. Panel mounting height shall be such that the top of the wall mount CTC does not exceed 80" above the finished floor.
7. Approved Manufacturers
   a. Hoffman Protek Series.
   b. Or Approved Equal.

2.7 PATCH PANELS

A. Each CTC cabinet shall be supplied with a 19" rack mountable 110 punch down to RJ45 jack patch panel. The panel shall be rated for CAT6 cabling.

B. The 110 punch blocks shall support wiring and be labeled for both T568A and T568B standards. The patch panel shall have at a minimum 24 RJ45 ports and at least 12 spare ports. Each RJ45 port shall have a plastic label holder for custom labels.

2.8 WALL JACKS AND PLATES

A. Jacks shall be TIA/EIA Category 6 Compliant and shall support wiring and be labeled for both T568A and T568B standards. Plates shall be constructed of high-impact, flame-retardant, UL 94V-0 thermoplastic. Plates shall be available in single gang with 1-4 ports and double gang with 8 ports. Color of jacks and plates shall be determined by the Owner.

2.9 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. Each CTC shall have a 3000VA UPS installed in it for surge protection and battery backup of critical network equipment. The UPS shall be 19" rack mountable and shall be mounted with sliding rails where possible.

B. Each UPS shall be capable of running the connected load for a minimum of 30 minutes.

C. UPS Electrical Input Specifications

1. Nominal Voltage: 120VAC
2. Voltage Range: 80-144VAC
3. Input Power Factor: > 0.95
4. Frequency: 60 Hz ±3 Hz.

D. UPS Electrical Output Specifications

1. Voltage Regulation: ± 3% of Nominal
2. Efficiency: > 85%
3. Frequency Regulation: ± 3 Hz on utility, ± 1 Hz on battery

E. UPS Communications Specifications

1. A USB port shall be available for monitoring and configuring the UPS. An appropriate cable shall be supplied to connect to the UPS with a PC.
2. An Ethernet port shall be available as an option with the ability to monitor and configure the UPS over an Ethernet network.

F. UPS Battery Specifications

1. All batteries shall be sealed, lead-acid batteries and shall be maintenance free. Batteries shall be hot-swappable. The UPS will indicate when the battery is weak and needs to be replaced.
2. The UPS shall be able to accept additional battery modules to extend the runtime of the UPS.

G. Acceptable Manufacturers
1. Powerware 5 or 9 Series.
2. APC Smart-UPS Series.
3. Or Approved Equal.

2.10 NETWORK SWITCHES

A. Each CTC shall contain a rack mountable network switch as indicated in the Contract Drawings.

B. Each PLC cabinet shall contain a DIN rail mountable network switch as indicated in the Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall utilize personnel to accomplish, or supervise the physical installation of all elements, components, accessories, or assemblies which it provides. The Contractor shall employ installers who are skilled and experienced in the installation and connection of all elements, components, accessories, and assemblies it provides.

B. All components of the SCS shall be the installation responsibility of the Contractor unless specifically noted otherwise. After the installation of the SCS is completed, the installation shall be inspected jointly by the Contractor and the Equipment Manufacturer's representatives. Any problems shall be corrected, and when both are satisfied with the installation, a written certification of the installation shall be delivered to the Engineer. The certification shall state that all cabling and terminations have been inspected and are installed in accordance with the manufacturer's guidelines.

C. All installations shall be done in conformance with EIA/TIA 568B standards and with the manufacturer's installation requirements. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the failure. Any and all damage to the cables during the construction of this project is the sole responsibility of the Contractor.

D. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 12 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 24 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 48 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 6 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: 3 inches.
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

5. Separation between Cables and Electrical Motors and Transformers: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 6 inches.

E. Miscellaneous Equipment. The Contractor shall provide any necessary screws, anchors, clamps, tie wraps, distribution rings, wire molding, and support hardware, etc., necessary to facilitate the installation of the CTCs within the SCS. All metal fasteners and straps in corrosive or wet areas shall be 316SS.

F. Special Equipment and Tools. It shall be the responsibility of the Contractor to furnish any special installation equipment or tools necessary to properly complete the SCS. This may include, but is

not limited to, tools for terminating cables, testing and splicing equipment for copper/fiber cables, communication devices, jack stands for cable reels, or cable wrenches.

G. Labeling. The Contractor shall be responsible for printed labels for all cables and cords, distribution frames, and outlet locations, according to Owner specifications. No labels are to be written by hand.

H. Cable Storage. The Contractor shall not roll or store cable reels without an appropriate underlay and the prior approval of the Owner.

I. Damages. The Contractor will be held responsible for any and all damages to portions of the building caused by it, its employees or subcontractors; including but not limited to:

1. Damage to any portion of the building caused by the movement of tools, materials or equipment.
2. Damage to any component of the construction of spaces "turned over" to the Contractor.
3. Damage to the electrical distribution system and/or space "turned over" to the Contractor.
4. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.

J. Penetrations of Walls, Floors, and Ceilings. The Contractor shall make no penetration of existing walls, floors and/or ceilings without the prior consent of the Owner. Where penetrations through acoustical walls, fire-rated doors or other walls for cableways are to be installed, such penetrations shall be sealed by the Contractor in compliance with applicable code requirements.

K. The CTC's and all components of the system shall be installed in a neat, workmanlike manner. Wiring color codes shall be strictly observed and terminations shall be uniform throughout the system. Identification markings and systems shall be uniform. TIA/EIA 568B wiring codes as shown on the drawings shall standardize all SCS wiring. The CTC shall be level and plumb.

L. All structured wiring shall be neatly routed, protected and tied down. Install Velcro wrap on all cable bundles within the network rack/enclosure. All cabinets shall be cleaned out. All spare parts and documentation shall be turned into the Owner.

M. At the completion of the SCS, the Contractor shall restore to its former condition, all aspects of the project site and on a daily basis, shall remove all waste and excess materials, rubbish debris, tools and equipment resulting from or used in the services provided under this Contract. All clean up, restoration, and removal noted above will be by the Contractor and at no cost to the Owner. If the Contractor fails in its duties under this paragraph, the Owner may upon notice to the Contractor perform the necessary clean up and deduct the costs thereof from any amounts due or to become due to the Contractor.

3.2 NETWORK PROGRAMMING AND COMMISSIONING

A. Programming and Commissioning of the Network shall be by others.

3.3 TESTING

A. Optical Fiber Cable Testing

1. All fiber testing shall be performed on all fibers in the completed end to end system. There shall be no splices unless approved in writing by the Engineer. Testing shall consist of a bidirectional end to end OTDR trace performed per EIA/TIA 455-61. All tests shall be conducted using 200ft launch cables. The system loss measurements shall be provided at 850 and 1310 nanometers for multimode fibers and 1310nm and 1550 nm for singlemode fibers.
2. The Contractor shall test all fiber optic cable prior to the installation of the cable. The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.
3. Loss Budget: Fiber links shall have a maximum loss of:
   a. (3.0 dB loss/km)*(km of fiber in link) + (0.5dB) * (number of connectors)
   b. Note that a mated connector to connector interface is defined as a single connector for the loss calculation.
   c. Any link not meeting the requirements of the standard shall be brought into compliance by the Contractor, at no charge to the Owner.
4. Documentation of all fiber optic cabling tests shall be provided in both hard and electronic copies to the Engineer.

B. Copper cable testing

1. Testing of all copper wiring shall be performed prior to system commissioning. All Ethernet cabling shall be certified for conformance to EIA/TIA 568B for Category 6. Testing shall be done with a TIA/EIA Certified Level 3 test set. Test shall include length, mutual capacitance, characteristic impedance, attenuation, near-end and far-end crosstalk. Any pairs not meeting the requirements of the standard shall be brought into compliance by the Contractor at no charge to the Owner.
2. Documentation of all copper cabling tests shall be provided in both hard and electronic copies to the Engineer.

3.4 FIELD QUALITY CONTROL

A. On-going inspections shall be performed during construction by the Contractor and by the Engineer to ensure that all work is performed in a high quality manner and the overall appearance is clean, neat and orderly. The following points will be examined and must be satisfactorily complied with:

1. Is the design documentation complete? Are all cables properly labeled, from end-to-end?
2. Have all terminated cables been properly tested in accordance with the specifications for the specific category as well as tested for opens, shorts, polarity reversals, transposition and presence of AC and/or DC voltage?
3. Is the cable type suitable for its pathway? Are the cables bundled in parallel?
4. Have the pathway manufacturer's guidelines been followed? Are all cable penetrations installed properly and fire stopped according to code?
5. Has excessive cable bending been avoided?
6. Have potential EMI and RFI sources been considered?
7. Is Cable fill correct?

8. Are hanging supports within 1.5 meters (5 feet)?
9. Does hanging cable exhibit some sag?
10. Are telecommunications closet terminations compatible with applications equipment?
11. Have Patch Panel instructions been followed?
12. Are identification markings uniform, permanent and readable?

END OF SECTION 40 66 33

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SECTION 40 71 13 – MAGNETIC FLOW METERS

PART 1 - GENERAL

1.1 SUMMARY

A. Magnetic flow meters are used to provide continuous flow measurement of the process. The flow instrument consists of a transmitter and a flow element.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each process measurement system shall typically consist of a sensor and a transmitter. Where shown on the drawings, the transmitter may be utilized for multiple sensors. When a transmitter is used for multiple sensors, it shall be capable of displaying simultaneously each process measurement.

B. Each transmitter shall be equipped with means to transmit process measurement information to the plant SCADA system.

1. For hardwired signals, unless otherwise indicated on the drawings, provide the following:
    a. 4-20mA output signal for each process measurement (for up to 500 Ohm loads)
    b. Two programmable SPDT relay outputs, rated at 5A up to 230VAC, for each process measurement

C. Each transmitter shall be powered by 115VAC (± 10%) at 60Hz unless specifically shown on the drawings as being powered by 24VDC (± 15%). Each transmitter shall retain its programmable settings in non-volatile memory.

D. Each sensor and corresponding transmitter shall be supplied as a complete and operable system. This includes all cabling, mounting hardware and fasteners. When installed outdoors, the transmitter shall be protected from the sun such that direct sunlight will not shine on the display.

E. All transmitters shall be waterproof and made from corrosion resistant materials.

F. All sensors to be immersed in liquids shall be rated for permanent submersion and shall be corrosion resistant.

2.2 FLOW PROCESS MEASUREMENT DEVICES

A. MAGNETIC FLOW METER

1. Materials

    a. All mounting hardware shall be 316 stainless steel, the instrument enclosure and the spool mag shall be rated NEMA 4X, the flow sensor liner shall be hard rubber, and the electrode material shall be Hastelloy.

    b. Spool size shall be as specified on the drawings.

c. All applications with flow element below grade where no de-watering means or in submersible applications shall provide the flow element as NEMA 6P (IP-68).

d. Transmitter shall be integral or remote to the flow element as shown on the P&ID's.

2. Design and fabrication

a. Utilize characterized field principle of electromagnetic induction to produce signal directly proportional to flow rate. The meter shall use a pulsed DC magnetic field excitation.

b. Provide flanged end connections per ANSI B16 rated for piping system operating and test conditions.

c. Operating pressure: 150 psi.

d. Operating temperature: 32-150°F.

e. Grounding requirements: per manufacturer requirements. Typically, inlet and outlet grounding rings of same material as electrode.

f. When the transmitter is remote to the flow element, provide cable between flow element and transmitter. Coordinate with the installer the length of the cable required. No splices in any way will be allowed.

g. Complete zero stability shall be inherent to the meter system. The system shall have a programmable low flow cutoff.

h. Empty pipe detection to prevent false measurement when pipe is empty or partially filled.

i. Forward and reverse flow measurement and totalization as well as net flow totalization.

j. 4-20mA DC isolated output into maximum 800 ohms. Signal shall be programmable to indicate forward and/or reverse flow.

k. Provide a dry contact output for flow direction indication.

l. Provide a programmable frequency output for flow totalization.

m. ± 0.5% accuracy for flow rates above 1 fps.

3. Acceptable Manufacturers
   a. Siemens SITRANS F 5100W.
   b. Endress+Hauser Promag W 400.
   c. Rosemount 8700.
   d. ABB WaterMaster.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

B. Install all transmitters five feet above floor level. Install in a location that is easily accessible and visible while as near to the sensor(s) as possible.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 21 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid, and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 71 13

SECTION 40 71 79 – FLOW SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. A flow switch operates by conveying a trip motion proving process flow or alarming for loss of flow.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each flow switch shall accept 115VAC or 24VDC as shown on the Contract Drawings. It shall have two SPDT outputs rated at 5A up to 240VAC.

B. Each flow switch shall be supplied as a complete and operable system. This includes all cabling, mounting hardware and fasteners. When installed outdoors, the flow switch shall be protected from the sun such that direct sunlight will not shine on the display.

C. All flow switch shall be waterproof and made from corrosion resistant materials.

D. All sensors to be immersed in liquids shall be rated for permanent submersion and shall be corrosion resistant.

2.2 FLOW PROCESS MEASUREMENT DEVICES

A. FLOW SWITCHES

1. Paddle type flow switches

a. Paddle type flow switches shall be used for low flow, clean water applications such as seal water systems and eyewash stations.

b. The lower and upper housing shall be stainless steel and leak-proof. The machined tee, flow section, and other wetted parts shall be stainless steel with ½" NPT connections.

c. An adjustable bypass valve shall set the trip point of the switch.

d. The snap action switch shall be magnetically actuated and shall be SPDT and rated at 5A up to 250VAC.

e. Acceptable Manufacturers:
   1) Dwyer Model V6
   2) Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 21 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid, and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 71 79

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SECTION 40 72 43 – PRESSURE AND DIFFERENTIAL PRESSURE TYPE LEVEL METERS

PART 1 - GENERAL

1.1 SUMMARY

A. Pressure and differential pressure type level meters provide continuous level monitoring of the process. The pressure instrument consists of a transmitter and pressure measuring sensors.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each process measurement system shall typically consist of a sensor and a transmitter.

B. Each transmitter shall be equipped with means to transmit process measurement information to the plant SCADA system.

1. For hardwired signals, unless otherwise indicated on the drawings, provide the following:
   a. 4-20mA output signal for each process measurement (for up to 500 Ohm loads)
   b. Two programmable SPDT relay outputs, rated at 5A up to 230VAC, for each process measurement

C. Each transmitter shall be loop powered. Each transmitter shall retain its programmable settings in non-volatile memory.

D. Each sensor and corresponding transmitter shall be supplied as a complete and operable system. This includes all cabling, mounting hardware and fasteners. When installed outdoors, the transmitter shall be protected from the sun such that direct sunlight will not shine on the display.

E. All transmitters shall be waterproof and made from corrosion resistant materials.

F. All sensors to be immersed in liquids shall be rated for permanent submersion and shall be corrosion resistant.

2.2 LEVEL PROCESS MEASUREMENT DEVICES

A. SUBMERSIBLE LEVEL TRANSMITTERS

1. The submersible level transmitter shall consist of a submersible transducer, electronic transmitter, support cable, and interconnecting cable with cable shield and vent tube for atmospheric reference. The vent tube shall be provided with a replaceable moisture barrier. The submersible transducer shall be the strain gauge type suitable for sensing pressure equivalent to the liquid level range indicated.

2. The transducer shall have 316 stainless steel process wetted parts and shall be provided with a waterproof interconnecting cable. The transducer shall be suspended by a corrosion resistant cable as recommended by the manufacturer. The installation shall allow easy removal of the transducer and cable assembly for maintenance purposes. The electronic

level transmitter shall be remote mounted and shall produce a 4 - 20 mA DC signal linearly proportional to the level range indicated and be capable of driving a load of 700 ohms.

3. The interconnecting cable shall have a pull strength of 200 pounds, be factory attached to the transducer, and shall be terminated in a NEMA 4X 316SS enclosure. The enclosure shall house the vent tube moisture barrier and local indication.

4. The measurement system shall be suitable for the area classification and operation over a temperature range of 32 to 122 degrees Fahrenheit with an accuracy of plus or minus 0.5 percent of span. The transmitter shall have a non-fouling, large diaphragm (greater than 2"). The diaphragm shall be protected by a spacer assembly that also allows the transducer to sit on the floor of the wet well.

5. For lengths greater than 20 feet the transducer shall have ½" threads and shall be suspended in the wet well by ½" stainless steel conduit.

6. Acceptable Manufacturers
   a. TE KPSI model 750.
   b. Mercoid model PBLT2.
   c. Wika model LH-10 with LevelGuard attachment.
   d. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

B. Install all transmitters five feet above floor level. Install in a location that is easily accessible while as near to the sensor(s) as possible.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 21 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid, and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 72 43

SECTION 40 73 13 – PRESSURE AND DIFFERENTIAL PRESSURE GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Pressure and differential pressure gauges provide continuous pressure measurement of the process for local indication.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. All gauges shall be waterproof and made from corrosion resistant materials.

2.2 PRESSURE PROCESS MEASUREMENT DEVICES

A. General

1. All inline pressure instruments shall be supplied with isolation ball valve and bleed needle valve for each measurement point. Valve materials shall be selected based upon the properties of the liquid or gas and the atmosphere.

2. Unless otherwise indicated on the Contract Drawings, pressure process measurement devices shall measure process pressure relative to atmospheric pressure (gauge pressure).

3. Pressure process measurement devices which are to measure differential pressure shall have the appropriate inlet and outlet ports and isolation and bleed valves for each port.

4. All pressure instrumentation shall be properly mounted, ideally in locations that are easily accessible and viewable. Supply all appropriate mounting poles, plates, and accessories such that each instrument is properly supported and mounted.

B. Pressure Gauges

1. Pressure gauges shall be 4-1/2 inches in diameter with white laminated dials and black graduations. Windows shall be shatterproof glass acrylic. Gauges shall have a blowout disc and be encased in phenolic, steel, or cast iron. Measuring element shall be a stainless-steel bourdon tube with welded, stress-relieved joints. Socket shall have wrench flats. Movement shall be rotary geared stainless-steel material. Gauges shall perform as a liquid-filled gauge in a dry gauge and fight against vibration and pulsations. Gauges shall be calibrated to read in applicable units. Accuracy shall be plus and minus 1/2 percent range to 150 percent of the working pressure or vacuum of the pipe or vessel to which they are connected.

2. Acceptable Manufacturers
   a. Ashcroft 1279.
   b. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 21 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems.

B. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 73 13

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SECTION 40 73 26 – GAUGE-PRESSURE TRANSMITTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Gauge pressure transmitters provide continuous pressure measurement of the process.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as

required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each process measurement system shall consist of a sensor and a transmitter. Where shown on the drawings, the /transmitter may be utilized for multiple sensors. When an /transmitter is used for multiple sensors, it shall be capable of displaying simultaneously each process measurement.

B. Each transmitter shall be equipped with means to transmit process measurement information to the plant SCADA system.

1. For hardwired signals, unless otherwise indicated on the drawings, provide the following:
   a. 4-20mA output signal for each process measurement (for up to 500 Ohm loads)
   b. Two programmable SPDT relay outputs, rated at 5A up to 230VAC, for each process measurement

C. Each transmitter shall be loop powered. Each /transmitter shall retain its programmable settings in non-volatile memory.

D. Each sensor and corresponding transmitter shall be supplied as a complete and operable system. This includes all cabling, mounting hardware and fasteners. When installed outdoors, the transmitter shall be protected from the sun such that direct sunlight will not shine on the display.

E. All transmitters shall be waterproof and made from corrosion resistant materials.

F. All sensors shall be rated for permanent submersion and shall be corrosion resistant.

2.2 PRESSURE PROCESS MEASUREMENT DEVICES

A. General

1. All inline pressure instruments shall be supplied with isolation ball valve and bleed needle valve for each measurement point. Valve materials shall be selected based upon the properties of the liquid or gas and the atmosphere.

2. Unless otherwise indicated on the Contract Drawings, pressure process measurement devices shall measure process pressure relative to atmospheric pressure (gauge pressure).

3. Pressure process measurement devices which are to measure differential pressure shall have the appropriate inlet and outlet ports and isolation and bleed valves for each port.

4. All pressure instrumentation shall be properly mounted, ideally in locations that are easily accessible and viewable. Supply all appropriate mounting poles, plates, and accessories such that each instrument is properly supported and mounted.

B. Pressure Transmitters

1. Electronic gauge pressure transmitters shall consist of a capsule assembly, bottom works, vent plug, drain plug, cover flange, ½" NPT process connector and connection, amplifier unit, integral indicator, terminal box with cover, block and bleed valves, and conduit connections.

2. Transmitter shall be rated NEMA 4X. For hazardous locations, it shall be installed with an appropriate intrinsically safe barrier to guarantee the circuit may not abnormally create an ignition.

3. Transmitter shall be of a two-wire, 24VDC loop powered, producing 4 to 20 mA output proportional to the calibrated range of the instrument, capable of driving a 600-ohm load.

4. Static pressure rating shall be a minimum of 500 psig. The maximum over range pressure limit shall be a minimum of 150% of the range. Span shall be adjustable over a minimum of 5:1 range.

5. The 4 to 20 mA signal shall be capable of being calibrated electronically. Output signal damping shall be provided as an internal adjustment. Equipment shall be suitable for an ambient operating range of -40°F to +176°F. The transmitter shall be equipped with the Hart protocol.

6. Accuracy, including linearity and repeatability, shall be a plus or minus 0.2 percent of span. Gauge pressure transmitters used for flow service shall include square root extraction to produce an output signal linearly proportional to flow. Wetted parts, including block and bleed valve parts, shall be constructed of 316 stainless steel.

7. Acceptable Manufacturers
   a. Rosemount 2051.
   b. Siemens SITRANS P320.
   c. Endress + Hauser Cerabar PMP51.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

B. Install all transmitters five feet above floor level. Install in a location that is easily accessible while as near to the sensor(s) as possible.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 26 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid, and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 73 26

SECTION 40 73 36 – PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Pressure and differential pressure switches are used to prove a process condition for interlocking or alarming.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each pressure switch shall be equipped with contacts shall be rated for a minimum of 5 Amps at 120 VAC.

B. Each pressure switch shall be supplied as a complete and operable system. This includes all cabling, mounting hardware and fasteners. When installed outdoors, the pressure switch shall be protected from the sun such that direct sunlight will not shine on the display.

C. All pressure switch shall be waterproof and made from corrosion resistant materials.

2.2 PRESSURE PROCESS MEASUREMENT DEVICES

A. General

1. All inline pressure instruments shall be supplied with isolation ball valve and bleed needle valve for each measurement point. Valve materials shall be selected based upon the properties of the liquid or gas and the atmosphere.

2. Unless otherwise indicated on the Contract Drawings, pressure process measurement devices shall measure process pressure relative to atmospheric pressure (gauge pressure).

3. Pressure process measurement devices which are to measure differential pressure shall have the appropriate inlet and outlet ports and isolation and bleed valves for each port.

4. All pressure instrumentation shall be properly mounted, ideally in locations that are easily accessible and viewable. Supply all appropriate mounting poles, plates, and accessories such that each instrument is properly supported and mounted.

B. Pressure Switches

1. For unclassified locations, pressure switches shall be housed in a NEMA 4X enclosure. For classified locations, pressure switches shall be housed in a NEMA 7 enclosure.

2. Gauge and Differential pressures switches shall be diaphragm-actuated, dual adjustable, with SPDT snap action switch. Contacts shall be rated for a minimum of 5 Amps at 120 VAC. The dead band shall be adjustable up to 60 percent of full scale. Set points shall fall between 20 and 80 percent of the adjustable range. The diaphragm shall be Buna-N, unless

otherwise indicated, and the lower housing shall be brass with a 1/4-inch bottom sensing connection, unless otherwise indicated.

3. Acceptable Manufacturers
   a. Ashcroft Series B (Gauge) and D (Differential).
   b. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

B. Install all pressure switches five feet above floor level. Install in a location that is easily accessible while as near to the sensor(s) as possible.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 21 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid, and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 73 36

SECTION 40 73 63 – DIAPHRAGM SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. Diaphragm seals provide a means to measure pressure while keeping the pressure sensing device isolated from the process. These are commonly used for services that would plug the small passages in the pressure sensing device.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Dimensional Drawings
   2. Materials of Construction
   3. Measurement Accuracy
   4. Range and range ability
   5. Enclosure Rating
   6. Classification Rating

B. Instrumentation TR20 forms.

1.3 INFORMATIONAL SUBMITTALS

A. All submittals as required in 40 61 13.

1.4 QUALITY ASSURANCE

A. Equipment to be furnished under this section shall be the product of firms regularly engaged in the design and manufacturing of this type of equipment. Manufacturer shall assume responsibility for, and guarantee performance of equipment furnished. However, this shall not be construed as relieving the Contractor from responsibility for the proper installation and functionality of the work.

B. Examine the Contract Documents and verify that instruments being provided are compatible with the physical and process conditions associated with the instrument. This includes compatibility with liquids, gases, pressures, temperatures, flows, materials, locations, and mounting requirements. Provide all necessary accessories to the instrument for a complete and operable system.

C. All process lower and upper ranges to be coordinated with Engineer prior to instrument submittals being submitted.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver the process measurement equipment as a complete system. Each system shall be properly tagged and identified with its corresponding instrument tag as shown on the P&ID's and as required in section 26 05 00. Each system shall be factory calibrated and certified prior to delivery.

PART 2 - PRODUCTS

2.1 GENERAL

A. Each diaphragm seal shall consist of a diaphragm, fill fluid, and piping connection for mounting of transmitter. Each unit shall be arranged and designed to directly transmit the process measure by means of fluid through an opening in the lower housing to a pressure sensing device attached and sealed to the upper housing. Diaphragm seals shall be factory assembled to the pressure sensing device.

B. All diaphragm seals shall be made from corrosion resistant materials.

2.2 PRESSURE PROCESS MEASUREMENT DEVICES

A. Inline Pressure Diaphragm Seals

1. Diaphragm seals shall consist of bottom housing, lower ring, diaphragm capsule, fill screw, flushing connection, and a top housing.

2. The diaphragm seal shall attach to the inlet connection of a pressure instrument to isolate its measuring element from the process fluid. The space between the diaphragm and the pressure element shall be completely filled with a suitable liquid. Displacement of the liquid fill in the pressure element through the movement of the diaphragm shall transmit process pressure changes directly to a gauge, transmitter, switch, or other pressure instrument. The diaphragm seal shall have a removable bottom housing to permit servicing. The diaphragm seal shall be factory assembled to the corresponding pressure instrument and be factory-filled. The assembly shall be shipped with a tag reading "Do not disassemble for installation."

3. For sewage, sludge, liquids containing solids, corrosive gases, provide seals with 316SS diaphragm and housing. Nuts, bolts, fill connection and valved flush components shall also be 316SS.

4. For chemical solutions and for liquids or gases that will corrode 316SS, provide seals with PVC body and Viton FKM (for vacuum and up to 15 PSI) or PTFE (for above 15 psi) diaphragm material.

5. Acceptable Manufacturers
   a. Ashcroft model 101 (for 316SS diaphragm seals).
   b. Plast-O-Matic Valves Inc. Series GGS (for PVC body diaphragm seals).
   c. Or Approved Equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment and materials specified in this section shall be installed, connected, and tested in accordance with the manufacturers' recommendations and as required by these specifications and contract drawings. Contractor shall coordinate with other trades to insure proper connection to piping and other mechanical equipment.

3.2 CALIBRATION AND COMMISSIONING

A. A manufacturer representative shall field calibrate the process measurement system as required by section 40 61 21 and per the manufacturer's documented calibration procedure. The system shall be calibrated to the proper ranges as required by the Owner and the Engineer. Where analog signals are connected to local or remote monitoring equipment, verify that the calibrated ranges and scaling of the local and remote indicators are correct.

B. Prior to final acceptance of the work, the Contractor shall certify the equipment and installation included under this section to be free of defects, and suitable for trouble-free operation.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect the installation of the process measurement systems. Verify that the incoming power is within the required range. Verify the functionality of all output signals and communications connections.

2. Test the process measurement system for proper operation at low, mid, and high process conditions.

B. Document data for each measurement and for system calibration. Update the TR20 instrument forms following testing and calibration. These shall be submitted as part of the O&M manual as called for in section 40 61 13.

3.4 TRAINING

A. Provide a minimum of four hours of training for each type of process measurement system provided. Provide training in accordance with section 40 61 26.

END OF SECTION 40 73 63

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