Project Manual

Bid Set

Contract Documents

Kachina Water Storage Tank

March 2017

Village of Taos Ski Valley

1485 Florida Road, Suite C206
Durango, CO 81301

Ph 970-247-0724

www.feiengineers.com

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C-111 – ADVERTISEMENT FOR BIDS

VILLAGE OF TAOS SKI VALLEY
TAOS, NEW MEXICO
KACHINA WATER STORAGE TANK PROJECT

Sealed Bids for the Kachina Water Storage Tank Project will be received by the Village of Taos Ski Valley, Attn: Nancy Grabowski, 7 Firehouse Road, P.O. Box 100, Taos Ski Valley, NM 87525 until 2:00 p.m. local time on April 21, 2017. Bids received after this time will not be accepted.

All Bids that have been duly received will be opened publicly and read aloud. All interested parties are invited to attend. The Owner reserves the right to reject any or all Bids and to waive irregularities or informalities in any bid, and all Bidders shall agree that such rejection shall be without liability on the part of the Owner for any damage or claim brought by any Bidder because of such rejection, nor shall the Bidders seek any recourse of any kind against the Owner because of such rejections. No bid may be withdrawn within a period of 60 days. The filing of any Bid in response to this invitation shall constitute an agreement of the Bidder to these conditions.

Bids will be received on a lump sum basis with schedule of sections as indicated in the Bid Form. The Work is generally described as follows:

> The proposed Kachina Water Storage tank is a 250,000 gallon below grade concrete tank. The tank will connect to the existing Village of Taos Ski Valley potable water distribution system. The site is located at an approximate elevation of 10,500 feet; the terrain is heavily vegetated with an approximate 20 percent grade. The Work includes a 900 linear foot extension of 8 inch ductile iron pipe waterline connecting the existing distribution system to the proposed tank. Work also includes installation of fiber and electrical conduits paralleling the waterline and construction of approximately 1050 linear feet of gravel access road. A below grade concrete control vault, located adjacent to the water storage tank, will house isolation and control valves. The control valves will be integrated into the existing SCADA system. Pressure sensors at the tank will control the tank levels and filling of the tank from the existing Kachina booster pumps.

Bid Documents may be obtained from FEI Engineers, Attn: Heather Harris, 1485 Florida Road #C206, Durango, CO 81301, (970) 247-0724. Hard copies may be obtained upon a non-refundable deposit of $200.00 for one set of bidding documents consisting of one copy of the Project Manual and one set of 11" x 17" Drawings. The shipping charge will depend on the method selected by the Bidder. Bidding documents in PDF format may be obtained at no expense via email request to heather.harris@feiengineers.com; however, the Bidder is responsible for scalability of the drawings.

A large part of the communication regarding this procurement will be conducted by e-mail and Bidders must have a valid e-mail address to receive these correspondence.

A **mandatory** pre-bid conference will be held at 12:00 p.m. local time on April 6, 2017 at 7 Firehouse Road, Taos Ski Valley, NM 87525. Failure to attend the pre-bid conference will disqualify a potential bidder.

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Bids shall include Bid security in the form of a certified or bank cashier's check or a Bid Bond in the amount of 5% of total Bid price. The Bidder to whom a Contract is awarded will be required to furnish Performance, Payment and Warranty Bonds.

Owner: Village of Taos Ski Valley

By: Mark Fratrick

Title: Village Administrator

Date: March 19, 2017

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C-200 - INSTRUCTIONS TO BIDDERS

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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.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid the following additional information:

A. C-411 - Qualification Statement

B. C-412 - Project References

C. C-413 - Subconsultants and Suppliers Qualifications

D. C-414 - Affidavit of Non-Collusions

E. C-422 - Statement of Intent to Pay Prevailing Wages

F. C-430 - Bid Bond

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.

3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

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ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 *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.

4.02 *Existing Site Conditions*

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:

a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

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.

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: The Bidding Documents contain a Geotechnical Baseline Report (GBR). 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.

The Baseline Conditions in the GBR are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely

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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.

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.

B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 *Site Visit and Testing by Bidders*

A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.

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

C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder 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.

D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms

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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.

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

4.04 *Owner's Safety Program*

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

4.05 *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 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

E. consider 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 Site-related reports and drawings identified in the Bidding Documents, with

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respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;

F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

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

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 A pre-Bid conference will be held at the time and location stated in the invitation or advertisement to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are mandated to attend and participate in the conference. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than 7 calendar days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

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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 certified check, bank money order, or a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

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

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven calendar days after the Effective Date of the Contract or 61 calendar 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 seven calendar days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

9.01 The number of calendar days within which the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 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 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 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.

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ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 Any Bidder shall submit with the bidding documents a list of the Subcontractors or Suppliers proposed for the Work.

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

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

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall 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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13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

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

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

13.05 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.

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

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

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

13.09 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 *Lump Sum*

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

ARTICLE 15 – SUBMITTAL OF BID

15.01 With each copy of the Bidding Documents, a Bidder is furnished 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 security and the other documents required to be submitted under the terms of Article 7 of the Bid Form.

15.02 A Bid shall be received no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall 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 shall 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 shall be enclosed in a separate package plainly marked on the outside with the notation "BID

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ENCLOSED." A mailed Bid shall be addressed to Village of Taos Ski Valley, Attn: Nancy Grabowski, 7 Firehouse Road, P.O. Box 100, Taos Ski Valley, NM 87525.

15.03 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.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

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

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

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

ARTICLE 17 – OPENING OF BIDS

17.01 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 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

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

19.03 Evaluation of Bids

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

19.04 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.

19.05 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 20 – BONDS AND INSURANCE

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

ARTICLE 21 – SIGNING OF AGREEMENT

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

ARTICLE 22 – SALES AND USE TAXES

22.01 NMGRT on materials and equipment to be incorporated in the work shall not be included in the Bid. NMGRT will be added to Contractor's Application for Payment. The applicable tax rate is defined by the Village of Taos Ski Valley TIDD location code 20-430 and is a tax rate at 8.6875%.

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C-410 - BID FORM
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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

Village of Taos Ski Valley
7 Firehouse Road
P.O. Box 100
Taos Ski Valley, NM 87525

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 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 calendar days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	**Addendum Date**

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

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

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

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E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

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

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

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

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

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

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

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

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

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

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

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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 e execution of the Contract.

ARTICLE 5 – BASIS OF BID

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

1.	Bonding, Mobilization, and Insurance (5% maximum)	$ _____
2.	Site Work	$ _____
3.	Trail Relocation	$ _____
4.	Waterline	$ _____
5.	Dry Utilities	$ _____
6.	Access Road	$ _____
7.	Kachina Tank	$ _____
8.	Control Valve Vault	$ _____
9.	Yard Piping	$ _____
10.	Electrical / Instrumentation and Controls (I&C) Systems	$ _____
11.	NSF Compliance Testing	$ 6,200
12.	Geotechnical Allowance	$ 25,000
	SUBTOTAL LUMP SUM BID PRICE (Items 1 through 11)	**$** _____
	NMGRT @ 8.6875%	$ _____
	TOTAL LUMP SUM BID PRICE (Items 1 through 7)	**$** _____

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 accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

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

A. C-411 - Qualification Statement

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B. C-412 - Project References

C. C-413 - Subconsultants and Suppliers Qualifications

D. C-414 - Affidavit of Non-Collusions

E. C-422 - Statement of Intent to Pay Prevailing Wages

F. C-430 - Bid Bond

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER

_____

Bidder's Name

By: _____

Signature

_____

Print Name Date

_____

Title

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

Attest: _____

Signature

_____

Print Name Date

_____

Title

Address for giving notices: _____

_____

Telephone Number: _____

Contact Name: _____

E-mail address: _____

Submit Date: _____

License No.: *(where applicable)* _____

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C-411 – QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: _____

Address: _____

_____

_____

2. SUBMITTED TO: _____

3. SUBMITTED FOR: _____

Owner: _____

Project Name: _____

_____

_____

TYPE OF WORK: _____

_____

_____

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: _____

Title: _____

Phone: _____

Email: _____

5. AFFILIATED COMPANIES:

Name: _____

Address: _____

_____

6. TYPE OF ORGANIZATION:

☐ SOLE PROPRIETORSHIP

Name of Owner: _____

Doing Business As: _____

Date of Organization: _____

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☐ PARTNERSHIP

Date of Organization: _____

Type of Partnership: _____

Name of General Partner(s): _____

_____

_____

☐ CORPORATION

State of Organization: _____

Date of Organization: _____

Executive Officers:

- President: _____
- Vice President(s): _____

_____

_____

- Treasurer: _____
- Secretary: _____

☐ LIMITED LIABILITY COMPANY

State of Organization: _____

Date of Organization: _____

Members: _____

_____

_____

_____

☐ JOINT VENTURE

Sate of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____
- Address: _____

_____

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Joint Venture Managing Partner

- Name: _____
- Address: _____

_____

Joint Venture Managing Partner

- Name: _____
- Address: _____

_____

7. LICENSING

Jurisdiction: _____

Type of License: _____

License Number: _____

Jurisdiction: _____

Type of License: _____

License Number: _____

8. CERTIFICATIONS CERTIFIED BY:

Disadvantage Business Enterprise: _____

Minority Business Enterprise: _____

Woman Owned Enterprise: _____

Small Business Enterprise: _____

Other (_____): _____

9. BONDING INFORMATION

Bonding Company: _____

Address: _____

_____

Bonding Agent: _____

Address: _____

_____

Phone: _____

Aggregate Bonding Capacity: _____

Available Bonding Capacity as of date of this submittal: _____

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10. FINANCIAL INFORMATION

Financial Institution: _____

Address: _____

_____

Account Manager: _____

Phone: _____

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current and Previous Experience:

List on Form C-412 – Project References included in these Bid Documents.

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

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I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BIDDER

Firm Name

By: _____

Signature

Print Name Date

Title

Attest: _____

Signature

Print Name Date

Title

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C-412 - PROJECT REFERENCES

List uncompleted projects currently under contract and projects completed within the last 5 Years.
(If Joint Venture list each participant's projects separately).

TYPE OF PROJECT	FIRM NAME AND BUSINESS ADDRESS, PHONE #	CONTRACT DATE	VALUE OF CONTRACT
			$
			$
			$
			$
			$

BIDDER

Bidder's Name

By:

Signature

Print Name Date

Title

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C-413 - SUBCONTRACTOR AND SUPPLIER QUALIFICATIONS

List all Subcontractors and Suppliers below. The Subcontractor's list shall be accompanied by an attached experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor. The following Subcontractors will be employed to perform the designated categories of work under this Contract.

CATEGORY OF WORK*	FIRM NAME AND BUSINESS ADDRESS, PHONE # AND LICENSE NUMBER OF SUBCONTRACTORS, SUPPLIERS AND MATERIALS	RANGES**

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BIDDER

Firm Name

By:

Signature

Print Name Date

Title

*Place title of subcontractor specialty

**Subcontractor's contract range: In the column marked "Range" enter the letter corresponding to subcontract amount.

A = Less than $2,000

B = Equal to or greater than $2,000 but less than $10,000

C = Equal to or greater than $10,000 but less than $100,000

D = Equal to or greater than $100,000

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C-414 – AFFIDAVIT OF NON-COLLUSION

TO BE EXECUTED BY EACH AWARDEE OF A PRINCIPAL CONTRACT

I, _____, being first duly sworn, deposes and says that they are

_____ of _____

(sole owner, a partner, president, etc.)

the party making the foregoing bid; that such a bid is not made in the interest of or on behalf of any undisclosed person, partnership, company association, organization, or corporation; that such a bid is genuine and not collusive or sham; that said bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirect colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, nor that anyone shall refrain from bidding; that said bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of said bidder or of any other bidder, nor to fix any overhead, profit, or cost element of such bid price, nor of that of any other bidder, nor to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in such bid are true; and, further, that said bidder has not directly or indirectly, submitted his bid price or any breakdown thereof, nor the contents thereof, nor divulged information or data relative thereto, nor paid and will not pay fee in connection therewith to any corporation, partnership, company, association, organization, bid depository, nor any member or agent thereof, nor any to any other individual except to such person or persons as have a partnership or other financial interest with said bidder in his general business.

BIDDER

By: _____

Signature

_____

Print Name Date

_____

Title

Attest: _____

Signature

_____

Print Name Date

_____

Title

EJCDC® C-414, Affidavit of Non-Collusion.
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C-422 - STATEMENT OF INTENT TO PAY PREVAILING WAGES

TO BE COMPLETED BEFORE CONSTRUCTION STARTS
ALL FIELDS ARE REQUIRED
FORM MUST BE SENT TO THE CONTRACTING AGENCY WITHIN 3 DAYS OF AWARD

General Contractor Information		
Company Name:		
Address:		
City :	State:	Zip:
Phone:	Fax:	Email:
Estimated Start Date**:**	**State Wage Decision Number:**	
Project Title:	Project Physical Address:	
Total Contract Amount:	Estimated Completion Date:	
Print Name:	General Contractor Signature**:**	

Subcontractor Information		
Company Name:		
Address:		
City :	State:	Zip:
Phone:	Fax:	Email:
Sub Contract Amount:	Start date on this project:	
Print Name:	Subcontractor Signature:	

2nd, 3rd, etc. Tier Sub-Contractor Information		
Company Name:		
Address:		
City :	State:	Zip:
Phone:	Fax:	Email:
Print Name:	Tier Signature:	

I hereby certify that the above information is correct and that all workers I employ on this public works project will be paid no less than the Prevailing Wage Rate(s) as determined by the Department of Workforce Solutions, Labor Relations Division for this project as identified by the State Wage Decision Number. I understand that contractors who violate Prevailing Wage Laws (i.e., incorrect job classification, improper payment of prevailing wages, and/or overtime, etc.), are subject to debarment procedures and shall be required to pay any back wages due to workers. (Ref. Labor Relations Division, Public Works Minimum Wage Act Policy Manual (11.1.2 NMAC) & Public Works Minimum Wage Act (13-4-11 through 13-4-18, NMSA 1978).

_____

Contractor's Signature Date

INSTRUCTIONS FOR COMPLETING STATEMENT OF INTENT TO PAY PREVAILING WAGES

GENERAL CONTRACTOR

1. Enter general contractor information and provide signature.
2. Enter State Wage Decision Number as listed in bid documents. (Example: BE-13-0123 B)
3. Enter project title - listed in bid documents.
4. Enter project physical address - exact location of project (job site).
5. Enter estimated start & completion dates of project.
6. Enter general contractor's contract amount.
7. All Statements must be sent to the Contracting Agency.

SUB CONTRACTOR

1. Enter general contractor information, but general contractor signature is not needed.

2. Enter sub contractor information as indicated and provide signature.
3. Enter sub contractor contract amount.

NOTE: A separate signed form is needed for each contractor.

2ND TIER SUB CONTRACTOR

1. Enter general contractor information, but general contractor signature is not needed.

2. Enter sub contractor information; subcontractor signature not needed.
3. Enter 2nd tier sub information and provide signature.
4. Enter 2nd tier contractors contract amount.

3RD TIER AND HIGHER CONTRACTOR

1. Attach a copy of this completed form & list the 3rd tier contractor information under the 2nd tier

SECTION C-423
NEW MEXICO LABOR DECISION

The remaining portion of this page is intentionally blank; see next page for labor wage decision.

TYPE "A" - STREET, HIGHWAY, UTILITY & LIGHT ENGINEERING

Effective January 1, 2016

Trade Classification	Base Rate	Fringe Rate
Bricklayer/Blocklayer/Stonemason	23.32	8.04
Carpenter/Lather	23.40	9.02
Cement Mason	17.11	6.32
Ironworker	26.50	14.32
Painter (Brush/Roller/Spray)	16.00	5.58
Electricians (outside)		
Groundman	21.28	10.53
Equipment Operator	30.54	12.94
Lineman/Wireman or Tech	35.94	14.34
Cable Splicer	39.52	15.28
Plumber/Pipefitter	28.30	4.07
Laborers		
Group I	12.20	5.30
Group II	12.50	5.30
Group III	12.90	5.30
Operators		
Group I	16.69	6.16
Group II	17.44	6.16
Group III	17.55	6.16
Group IV	17.63	6.16
Group V	17.75	6.16
Group VI	17.89	6.16
Group VII	18.27	6.16
Group VIII	18.50	6.16
Group IX	25.45	6.16
Group X	28.35	6.16
Truck Drivers		
Group I	13.32	0.26
Group II	13.52	0.26
Group III	13.72	0.26
Group IV	13.92	0.26

NOTE: SUBSISTENCE, ZONE AND INCENTIVE PAY APPLY ACCORDING TO THE PARTICULAR TRADES COLLECTIVE BARGAINING AGREEMENT. DETAILS ARE LOCATED AT WWW.DWS.STATE.NM.US.

TYPE "B" - GENERAL BUILDING
Effective January 1, 2017

	Base Rate	Fringe Rate	Apprenticeship
Asbestos Worker - Heat & Frost Insulator	31.26	11.11	0.50
Boilermaker	21.77	3.98	0.50
Bricklayer/Blocklayer/Stone mason	23.46	7.66	0.50
Carpenter/Lather	23.75	8.77	0.50
Cement Mason	19.96	9.57	0.50
Electricians			
Outside Classifications			
Groundman	21.81	10.70	0.50
Equipment Operator	31.31	13.08	0.50
Lineman/Tech	36.83	14.45	0.50
Cable Splicer	40.51	15.38	0.50
Inside Classifications			
Wireman/Technician	30.00	10.15	0.50
Cable Splicer	33.00	10.24	0.50
Sound Classifications			
Installer	23.39	8.31	0.50
Technician	28.95	7.52	0.50
Soundman	27.01	8.31	0.50
Elevator Constructor	38.37	28.08	0.50
Elevator Constructor Helper	26.86	28.08	0.50
Glazier	20.15	4.35	0.50
Ironworker	26.50	13.68	0.50
Painter (Brush/Roller/Spray)	16.60	5.38	0.50
Paper Hanger	16.60	5.38	0.50
Drywall Finisher/Taper	23.75	8.77	0.50
Plasterer	21.66	7.93	0.50
Plumber/Pipefitter	28.87	10.83	0.50
Roofer	15.18	0.50	0.50
Sheetmetal Worker	28.28	15.91	0.50
Soft Floor Layer	23.75	8.77	0.50
Sprinkler Fitter	28.90	18.82	0.50
Tile Setter	23.46	7.66	0.50
Tile Setter Helper/Finisher	15.53	7.66	0.50
Laborers			
Group I	16.09	5.38	0.50
Group II	16.74	5.38	0.50
Group III	17.71	5.38	0.50
Group IV	19.94	5.38	0.50
Operators			
Group I	19.96	6.10	0.50
Group II	21.97	6.10	0.50
Group III	22.40	6.10	0.50
Group IV	22.81	6.10	0.50
Group V	22.98	6.10	0.50
Group VI	23.18	6.10	0.50
Group VII	23.29	6.10	0.50
Group VIII	26.10	6.10	0.50
Group IX	28.32	6.10	0.50
Group X	31.48	6.10	0.50
Truck Drivers			
Group I	14.76	6.25	0.50
Group II	15.00	6.25	0.50
Group III	15.50	6.25	0.50
Group IV	15.51	6.25	0.50
Group V	15.60	6.25	0.50
Group VI	15.75	6.25	0.50
Group VII	15.90	6.25	0.50
Group VIII	16.11	6.25	0.50
Group IX	16.32	6.25	0.50

NOTE: SUBSISTENCE, ZONE AND INCENTIVE PAY APPLY ACCORDING TO THE PARTICULAR TRADES COLLECTIVE BARGAINING AGREEMENT. DETAILS ARE LOCATED AT WWW.DWS.STATE.NM.US.

TYPE "H" - HEAVY ENGINERRING

Effective January 1, 2016

Trade Classification	Base Rate	Fringe Rate	Apprenticeship
Asbestos Worker - Heat & Frost Insulator	31.26	11.11	0.50
Boilermaker	18.50	3.31	0.50
Bricklayer/Blocklayer/StoneMason	23.32	7.30	0.50
Carpenter/Lather	23.40	8.62	0.50
Millwright/Piledriver	31.00	14.56	0.50
Cement Mason	20.50	9.24	0.50
Electricians			
Outside Classifications			
Groundman	21.28	10.57	0.50
Equipment Operator	30.54	12.98	0.50
Lineman/Tech	35.93	14.23	0.50
Cable Splicer	39.52	15.13	0.50
Inside Classifications			
Wireman/Tech	29.70	9.94	0.50
Cable Splicer	32.67	10.03	0.50
Glazier	20.15	3.65	0.50
Ironworker	26.50	13.68	0.50
Painter (Brush/Roller/Spray)	21.17	6.53	0.50
Plumber/Pipefitter	31.14	11.55	0.50
Roofer	19.56	11.34	0.50
SheetmetalWorker	28.28	15.37	0.50
Operators			
Group I	17.67	5.83	0.50
Group II	18.76	5.83	0.50
Group III	19.41	5.83	0.50
Group IV	19.62	5.83	0.50
Group V	19.68	5.83	0.50
Group VI	19.82	5.83	0.50
Group VII	19.94	5.83	0.50
Group VIII	21.38	5.83	0.50
Group IX	26.45	5.83	0.50
Group X	29.35	5.83	0.50
Laborers			
Group I	18.00	5.05	0.50
Group II	19.18	5.05	0.50
Group III	19.53	5.05	0.50
Group IV	19.94	5.05	0.50
Group V	20.30	5.05	0.50
Group VI	19.03	5.05	0.50
Group VII	19.18	5.05	0.50
Group VIII	19.43	5.05	0.50
Group IX	19.63	5.05	0.50
Group X	20.30	5.05	0.50
Truck Drivers			
Group I	15.05	4.94	0.50
Group II	15.25	4.94	0.50
Group III	15.45	4.94	0.50
Group IV	15.65	4.94	0.50

NOTE: SUBSISTENCE, ZONE AND INCENTIVE PAY APPLY ACCORDING TO THE PARTICULAR TRADES COLLECTIVE BARGAINING AGREEMENT. DETAILS ARE LOCATED AT WWW.DWS.STATE.NM.US.

C-424 - CAMPAIGN CONTRIBUTION DISCLOSURE FORM

Pursuant to Chapter 81, Laws of 2006, any prospective Contractor seeking to enter into a contract with any state agency or local public body must file this form with the state agency or local public body. The prospective must disclose whether they, a family member or a representative of the prospective has made a campaign contribution to an applicable public official of the state or a local public body during the two years prior to the date on which the submits a proposal or, in the case of a sole source or small purchase contract, the two years prior to the date the signs the contract, if the aggregate total of contributions given by the prospective, a family member or representative of the prospective to the public official exceeds two hundred and fifty dollars ($250) over the two year period.

THIS FORM MUST BE FILED BY THE PROSPECTIVE RESPONDENT WHETHER OR NOT THEY, THEIR FAMILY MEMBER, OR THEIR REPRESENTATIVE HAVE MADE ANY CONTRIBUTIONS SUBJECT TO DISCLOSURE.

The following definitions apply:

"Applicable public official" means a person elected to an office or a person appointed to complete a term of an elected office, who has the authority to award or influence the award of the contract for which the prospective is submitting a competitive sealed proposal or who has the authority to negotiate a sole source or small purchase contract that may be awarded without submission of a sealed competitive proposal.

"Campaign contribution" means a gift, subscription, loan, advance or deposit of money or other thing of value, including the estimated value of an in-kind contribution, that is made to or received by an applicable public official or any person authorized to raise, collect or expend contributions on that official's behalf for the purpose of electing the official to either statewide or local office.

"Campaign Contribution" includes the payment of a debt incurred in an election campaign, but does not include the value of services provided without compensation or un-reimbursed travel or other personal expenses of individuals who volunteer a portion or all of their time on behalf of a candidate or political committee, nor does it include the administrative or solicitation expenses of a political committee that are paid by an organization that sponsors the committee.

"Contract" means any agreement for the procurement of items of tangible personal property, services, professional services or construction

"Family member" means spouse, father, mother, child, father-in-law, mother-in-law, daughter-in-law or son-in-law.

"Tendency of the procurement process" means the time period commencing with the public notice of the request for proposals and ending with the award of the contract or the cancellation of the request for proposals.

"Person" means any corporation, partnership, individual, joint venture association or any other private legal entity.

"Prospective" means a person who is subject to the competitive sealed proposal process set forth in the Procurement Code or is not required to submit a competitive sealed proposal because that person qualifies for a sole source or a small purchase contract.

"Representative of a prospective" means an officer or director of a corporation, a member or manager of a limited liability corporation, a partner of a partnership or a trustee of a trust of the prospective.

DISCLOSURE OF CONTRIBUTIONS applies to contributions made to the following Public Officials:

Neal King, Mayor

Board Members:

Thomas P. Wittman, Mayor Pro Tem
Christof Brownell, Councilor
Kathy Bennett, Councilor
Chris Staff, Councilor

Contributions made by: _____

Relation to Prospective: _____

Name of Applicable Public Official: _____

Date Contribution(s) made: _____

Amounts(s) of Contribution(s) _____

Nature of Contributions(s) _____

Purpose of Contributions(s) _____

_____ _____
Signature Date

_____
Title (position)

OR

NO CONTRIBUTIONS IN THE AFFREGATE TOTAL OVER TWO HUNDRED FIFTY DOLLARS ($250) WERE MADE to an applicable official by me, a family member or representative.

_____ _____
Signature Date

_____
Title (position)

C-430 - BID BOND (PENAL SUM FORM)

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

BIDDER *(name and address)*:

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

OWNER *(name and address)*:

BID

Bid Due Date:

Description *(Name and location)*:

BOND

Bond Number:

Date:

Penal Sum: *(Words)*

(Figures) $

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

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BIDDER	**SURETY**
(seal)	*(seal)*
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature *(attach power of attorney)*
_____	_____
Print Name	Print Name
_____	_____
Date	Date
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
_____	_____
Date	Date
_____	_____
Title	Title

Notes: (1) 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 shall be Owner's sole and exclusive remedy upon default of Bidder.

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

3. This obligation shall 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 shall not in the aggregate exceed 120 calendar days from the Bid due date without Surety's written consent.

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

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

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

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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 shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

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

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C-510 – NOTICE OF AWARD

Owner: Village of Taos Ski Valley

Contractor: _____

Engineer: FEI Engineers, Inc.

Project: Kachina Water Storage Tank

TO BIDDER:

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

the proposed Kachina Water Storage Tank which is a 250,000 gallon below grade concrete tank.

[Describe Work, Alternates, or Sections of Work Awarded]

The Contract Price of the awarded Contract is: $_____ *[note if subject to unit prices, or cost-plus]*

_____ 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. *[revise if multiple copies accompany the Notice of Award]*

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

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

1. Deliver to Owner _____ counterparts of the Agreement, fully executed by Bidder.
2. Deliver with the executed Agreement(s) the Contract security *[e.g., performance and payment bonds]* and insurance documentation as specified in the Instructions to Bidders and General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):

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.

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

OWNER

Village of Taos Ski Valley

Owner's Name

By: _____

Signature

_____

Date

_____

Print Name

_____

Title

Copy: Engineer

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C-520 - AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between Village of Taos Ski Valley ("Owner") and

("Contractor").

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:

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: The proposed tank will be a 250,000-gallon below grade concrete tank. The goals of the tank are to provide adequate pressure to the upper pressure zone, to provide additional finished water storage, to provide additional fire flow, and to allow for additional development within the higher elevation areas of the Village.

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by FEI Engineers, Inc.

3.02 The Owner has retained FEI Engineers, Inc. ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

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

4.02 *Contract Times: Calendar days*

A. The Work will be substantially completed within 130 calendar 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 150 calendar days after the date when the Contract Times commence to run.

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B. Parts of the Work shall be substantially completed on or before the following Milestone(s): Not Used.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $100.00 for each calendar days that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $100.00 for each calendar days that expires after such time until the Work is completed and ready for final payment.

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

4.04 *Special Damages*

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

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.

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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: $_____.

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

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 account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 15th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

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

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

b. 95 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 95 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General

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Conditions, and less the Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

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

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of 1 percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

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

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

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

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

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. 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 Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

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F. 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.

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

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

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

J. 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.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to___, inclusive).
2. Performance bond (pages ___ to ___, inclusive).
3. Payment bond (pages ___ to ___, inclusive).
4. Other bonds.
    a. ___ (pages ___ to ___, inclusive).
5. General Conditions (pages ___ to ___, inclusive).
6. Supplementary Conditions (pages ___ to ___, inclusive).
7. Specifications as listed in the table of contents of the Project Manual.
8. Drawings (not attached but incorporated by reference) consisting of ____ _____ sheets with each sheet bearing the following general title: _____
9. Addenda (pages ___ to ___, inclusive).
10. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid (pages ___ to ___, inclusive).
11. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

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a. Notice to Proceed.

b. Work Change Directives.

c. Change Orders.

d. Field Orders.

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

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

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

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

10.02 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, 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 Documents.

10.03 *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.

10.04 *Severability*

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

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10.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing 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.

10.06 *Other Provisions*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are based on EJCDC® C-700, Standard General Conditions for the Construction Contract, 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 pages _____ (which is the Effective Date of the Contract).

CONTRACTOR	**OWNER**
_____	_____
Contractor's Name	Owner's Name
By: _____	By: _____
Signature	Signature
Date: _____	Date: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Address: _____	Address: _____
_____	_____
Phone: _____	Phone: _____
Email: _____	Email: _____
(If Contractor is a corporation, a partnership, or joint venture attach evidence of authority to sign.)	(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)
Attest: _____	Attest: _____
Signature	Signature
Date: _____	Date: _____
Title: _____	Title: _____

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C-550 - NOTICE TO PROCEED

Owner: Village of Taos Ski Valley

Contractor: _____

Engineer: FEI Engineers, Inc.

Project: Kachina Water Storage Tank

TO CONTRACTOR:
Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on _____. *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, the number of calendar days to achieve Substantial Completion is 130 and the number of calendar days to achieve readiness for final payment is 150.

Before starting any Work at the Site, Contractor must comply with the following:
[Note any access limitations, security procedures, or other restrictions]

_____

_____

CONTRACTOR	**OWNER**
_____	Village of Taos Ski Valley
Contractor's Name	Owner's Name
By: _____	By: _____
Signature	Signature
_____	_____
Date	Date
_____	_____
Print Name	Print Name
_____	_____
Title	Title
(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)	*(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*
License No.: _____	*(where applicable)*

Copy: Engineer

EJCDC® C--550, Notice to Proceed.
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C-610 - PERFORMANCE BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:
Village of Taos Ski Valley
7 Firehouse Road, P.O. Box 100, Taos Ski Valley, NM 87525

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount: $
Description *(Name and location)*:

BOND
Bond Number:
Date:
(not earlier than the Effective Date of the Agreement of the Construction Contract)
Amount: $
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

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

BIDDER		**SURETY**	
	(seal)		*(seal)*
Bidder's Name and Corporate Seal		Surety's Name and Corporate Seal	
By:		By:	
Signature		Signature *(attach power of attorney)*	
Print Name		Print Name	
Title	Date	Title	Date
Attest:		Attest:	
Signature		Signature	
Title		Title	

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

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

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

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

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

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

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

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

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

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

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

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a

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qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

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

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

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven calendar days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

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

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

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

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

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

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

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

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

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

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

14. Definitions

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

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

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

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

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

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

16. Modifications to this Bond are as follows: _____

_____

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C-615 - PAYMENT BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:
Village of Taos Ski Valley
7 Firehouse Road, P.O. Box 100, Taos Ski Valley, NM 87525

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount: $
Description *(Name and location)*:

BOND
Bond Number:
Date:
(not earlier than the Effective Date of the Agreement of the Construction Contract)
Amount: $
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

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

CONTRACTOR	**SURETY**
(seal)	*(seal)*
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By:	By:
Signature	Signature *(attach power of attorney)*
Print Name	Print Name
Title Date	Title Date
Attest:	Attest:
Signature	Signature
Title	Title

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

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

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

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

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

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

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

5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) calendar 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, such notice 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) calendar days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

7.2 Pay or arrange for payment of any undisputed amounts.

7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under

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Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

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

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

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

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

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

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

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

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

16. Definitions

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

1. The name of the Claimant;

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

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

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

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

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

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

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

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

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

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

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

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

18. Modifications to this Bond are as follows: _____

_____

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SECTION C-620
APPLICATION FOR PAYMENT

APPLICATION PAYMENT NO. _____

Owner: Village of Taos Ski Valley
Project: Kachina Water Storage Tank

From Contractor: _____
Address: _____

Application Date: _____
Period: _____

Contractor's Project No. _____

Via Engineer: FEI Engineers, Inc.
Engineer's Job #: VTSV-14-0132: Task 11

CHANGE ORDER SUMMARY

APPROVED CHANGE ORDERS:

Number	Description	Additions	(Deductions)
1			
2			
3			
4			
5			
6			
7			
	TOTALS	$0.00	$0.00

NET CHANGE BY CHANGE ORDERS: $0.00

CONTRACTOR'S CERTIFICATION:

The undersigned Contractor certifies that (1) all previous progress payments received from Owner have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment in accordance with the Contract Documents and is not defective.

By: Date:

1	Original Contract Price:	$0.00
2	Net change by Change Orders:	$0.00
3	**Current contract price:** *(Line 1 +2)*	**$0.00**
4	Total Completed & Stored to Date: *(Column F on Schedule of Values)*	$0.00
5	Retainage: 5%	
a	Work Completed:	$0.00
b	Stored Materials:	$0.00
c	**Total retainage:** *(Line 5a + 5b)*	**$0.00**
6	Amount Eligible to date: *(Line 4 - Line 5c)*	$0.00
7	Less Previous Payments	$0.00
8	**Amount due this Application**	**$0.00**
9	Balance to Finish including retainage *(Column G on Schedule of Values plus Line 5c above)*	$0.00

Payment of: **$0.00**
(Line 8 or other - attach explanation of other amount)

Is recommended by:
FEI Engineers, Inc. Date

Payment of: $0.00
(Line 8 or other - attach explanation of other amount)

Is approved by Owner:
Village of Taos Ski Valley Date

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SECTION C-620
SCHEDULE OF VALUES

APPLICATION PAYMENT NO. _____

Project: Kachina Water Storage Tank
Application Number: _____

Project Number: VTSV-14-0132: Task 11
Application Period: _____

Contractor:
Application Date: _____

A		B	C	D	E	F		G
Item	**Description**	**Scheduled Value**	**Work Completed**		**Materials Presently Stored (not in C or D)**	**Total Completed and Stored to Date**	**%**	**Balance to Finish**
			From Previous Application (C+D)	**This Period**		**(C + D + E)**	**(F/B)**	**(B - F)**
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
	Totals							

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SECTION C-620
STORED MATERIALS

APPLICATION PAYMENT NO. _____

Project: Kachina Water Storage Tank — Application Number: _____

Project Number: VTSV-14-0132: Task 11 — Application Period: _____

Contractor: — Application Date: _____

A	B	C	D		E		F		G
Invoice No.	Shop Drawing Transmittal No.	Materials Description	Stored Previously		Stored this Month		Incorporated in Work		Materials Remaining in Storage ($) (D + E - F)
			Date (Month/Year)	Amount ($)	Amount ($)	Subtotal (D + E	Date (Month/Year)	Amount ($)	
		Totals							

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C-625 - CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Village of Taos Ski Valley
Contractor:	
Engineer:	FEI Engineers, Inc.
Project:	Kachina Water Storage Tank

This [preliminary] [final] Certificate of Substantial Completion applies to:

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

Date of Substantial Completion

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.

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 shall be as provided in the Contract, except as amended as follows:

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

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

_____

_____

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

_____

_____

_____

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.

RECOMMENDED:

By: _____
Engineer (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

ACCEPTED:

By: _____
Owner (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

RECEIVED:

By: _____
Contractor (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

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C-700 – STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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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 form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting 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, or both; 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, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents;

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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; or (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. 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), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5501 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree 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 the 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. *Engineer*—The individual or entity named as such in the Agreement.

21. *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.

22. *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. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the

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Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

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

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

25. *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.

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

27. *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.

28. *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.

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

30. *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.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

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

33. *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.

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

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35. *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.

36. *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.

37. *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 furnished by Owner which are designated for the use of Contractor.

38. *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.

39. *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.

40. *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 thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

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

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, 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.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

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45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

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

47. *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.

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

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. 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*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

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D. *Defective*:

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

a. does not conform to the Contract Documents; or

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

c. 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 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean 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, shall mean 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, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

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

F. 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 Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner's Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall

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promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), 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 executed 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 specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

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

2. a preliminary Schedule of Submittals; and

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

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

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

2.05 *Initial 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

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for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall 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.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items 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 items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one 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 or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

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

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

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, shall mean 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, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, 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, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

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

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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 shall 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 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 thereunder.

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 give written notice to Owner and Contractor 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 editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent

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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 shall preclude 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 thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth 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 shall be done at the Site prior to such date.

4.03 *Reference Points*

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

4.04 *Progress Schedule*

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

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

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall 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 shall be delayed or postponed

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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 the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the 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. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall 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 utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. 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.

E. Paragraph 8.03 governs 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.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times 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.

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G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

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

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

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

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; 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 7.12, 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 at law; 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

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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 shall conform to applicable Laws and Regulations.

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

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

5.03 *Subsurface and Physical Conditions*

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

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); 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 upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. 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; or

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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.

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 either:

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; or

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

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 the necessity of Owner's obtaining 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 above; 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. *Possible Price and Times Adjustments*:

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

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

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

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

c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

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; or

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 as 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, or both, then any such adjustment shall 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, or both, 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.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

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

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b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

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

d. 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 in the Contract Documents, or was not shown or indicated 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), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; 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 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. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, 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. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

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;

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c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

d. 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, or both, then any such adjustment shall 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, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

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

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

2. 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 Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. 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; or

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

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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, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, 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.

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

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or 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

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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.H shall obligate 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 shall obligate 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 all of Contractor's obligations under the Contract. These bonds shall 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 Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall 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 (as amended and supplemented) 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 shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor 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.

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D. If the surety on a bond furnished by Contractor 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 Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. 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.

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

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. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is maintaining the policies, coverages, and endorsements 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 and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements 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 and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. 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,

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shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of 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.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect 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 shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor 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 and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

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C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall 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 shall be maintained for three years after final payment.

   b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. 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 CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. 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.

D. *Automobile liability*: Contractor 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 shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor 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 Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of

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each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

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 Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) 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 Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed 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.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense

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Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. 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.

6.05 *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 full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

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4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).
5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
6. extend to cover damage or loss to insured property while in transit.
7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
8. allow for the waiver of the insurer's subrogation rights, as set forth below.
9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
10. not include a co-insurance clause.
11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
12. include performance/hot testing and start-up.
13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed 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.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

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 notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: 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 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools,

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construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. 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 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 Subcontractors, all individuals or entities identified in the Supplementary Conditions as 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. None of the above waivers shall extend 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. 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:

1. loss 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 perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner 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.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work 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

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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 builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 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 6.05 shall 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, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

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

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

7.02 *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 at all times maintain good discipline and order at the Site.

B. 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 shall 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

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on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *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 shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall 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 shall 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.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, 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 material or equipment, or items from other proposed suppliers under the circumstances described below.

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

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

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

2) it 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;

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3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it 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 shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment 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 material or equipment under the circumstances described below. To the extent possible such requests shall 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 material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.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 material or equipment that Contractor seeks to furnish or use. The application:

   a. shall 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 that specified, and

      3) be suited to the same use as that 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 that specified, and

      2) available engineering, sales, maintenance, repair, and replacement services.

   d. shall 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

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such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities 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, Supplier, or other individual or entity 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 five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. 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, Suppliers, or other individuals or entities 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, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

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G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

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

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create 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.

7.07 *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 a particular 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

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others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. 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

7.09 *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.

7.10 *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. Except where otherwise expressly required by applicable Laws and Regulations, 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

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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 shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give 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 notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

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

7.12 *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. 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.

B. 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. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work

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may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. 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.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.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).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall 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.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of 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 threatened 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 thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of

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the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified 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

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will 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.D.

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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.D.

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. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. 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, conform to the information given in 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 shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 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, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

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7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall 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.D.4.

E. *Resubmittal Procedures*:

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 submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

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 and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper 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.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

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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. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

D. 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 shall 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 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 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 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 shall 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.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

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1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

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

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notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. 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.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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.

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 at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner 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, or both. 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 shall take into account information (if any) regarding such other

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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. When applicable, any such equitable adjustment in Contract Price shall 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 is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

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. 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 to 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.

C. 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 to Contractor.

D. 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.

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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 shall be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

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

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

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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 Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

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

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

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

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

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. 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 *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 Paragraph 10.08. If Owner designates another representative or agent to represent

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Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

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

10.06 *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.

10.07 *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.

10.08 *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, shall 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.

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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 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 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *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 (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

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

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not 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, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: 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 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract

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Times, or both, no later than 60 days after issuance of the Work Change Directive.

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

11.02 *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. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes 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 shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate 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.

11.03 *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.

11.04 *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 shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

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

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allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.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 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall 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 shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five 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 11.01.C.2.a and 11.01.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.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 five 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 shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall 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 will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *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 shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

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B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. 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. The supporting data shall 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. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *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 that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

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11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the 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 11.02, (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 in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *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 shall be submitted 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; and

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.

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

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also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. 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 shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall 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. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, 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, shall 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 shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall 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, who 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

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Subcontractor's Cost of the Work and fee shall 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 for services specifically related to the Work.

5. Supplemental costs including 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, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the 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 property insurance established in accordance with Paragraph 6.05), 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 shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

    g. The cost of utilities, fuel, and sanitary facilities at the Site.

    h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

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i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety 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. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. 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.

5. 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*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

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.

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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 on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a 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 on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled

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to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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 will 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 therewith 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 shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

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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 shall 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 notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change

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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 special 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, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall 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 rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract

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Documents, then Owner may, after seven 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 on account of 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. 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 shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and 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.

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2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, or

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b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, 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 on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

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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 that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated 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;

l. there are other items entitling 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 shall 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 shall be treated as an amount due as determined by Paragraph 15.01.C.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 seven 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.

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Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall 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 seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

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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 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 6.05 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 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall 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 disputes that Contractor believes are unsettled; 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 Application and Acceptance*:

1. 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 ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall 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. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. 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. *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.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to

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Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

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 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 terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then 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 other adjacent areas;
2. correct such defective Work;
3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, 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 therefrom.

B. If 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 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 correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. 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.

D. 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.

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a

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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, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall 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) ten 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) 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 seven 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

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the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

A. Upon seven 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 on account of loss of anticipated overhead, profits, or revenue, 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 seven 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.

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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, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising 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; or

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 Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

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

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period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

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

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall 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 or completion of the Contract or termination 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 *Headings*

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

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C-800 - SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC 00700 (2013 Edition). All provisions which 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.

SC – 5.03. Subsurface and Physical Conditions

Add the following new paragraphs immediately after Paragraph 5.03.B:

C. In the preparation of Drawings and Specifications, Engineer relied upon the following reports of exploration and tests of subsurface conditions at the Site:

1. None.

D. In the preparation of Drawings and Specifications, Engineer relied upon the following drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the Site:

1. Not Used.

E. Copies of reports and drawings itemized in SC-5.03.C and SC-5.03.D that are not included with Bidding Documents may be examined at FEI Engineers, Inc; 1485 Florida Road #C206, Durango, CO 81301 during regular business hours. These reports and drawings are not part of the Contract Documents, but are the "technical data" contained therein upon which Contractor may rely as provided in Paragraph 5.03 of the General Conditions and are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Engineer in the preparation of Drawings and Specifications.

SC - 5.06. Hazardous Environmental Condition at Site

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.

SC – 6.03. Contractor's Liability Insurance

Add the following new paragraphs to GC-6.03 I. General Provisions:

6. Deductible. Any and all deductibles or self-insured retentions continued in any Insurance policy shall be assumed be and at the sole risk of the Contractor.

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7. In Force. If any of the said policies shall fail at any time to meet the requirements, or if a company issuing any such policy shall be or at any time cease to be approved by the Division of Insurance of the State of New Mexico, or be or cease to be in compliance with any stricter requirements, the Contractor shall promptly obtain a new policy.
8. Insurer. All requisite insurance shall be obtained from financially responsible insurance companies, authorized to do business in the State of New Mexico and acceptable to Owner.
9. Additional Insured. Owner and the State shall be named as additional insureds on the Commerical General Liability and Automobile Liability Insurance policies.
10. Primacy of Coverage. Coverage required of Contractor shall be primary over any insurance or self-insurance program carried by Owner or the State.
11. Cancellation. The insurance policies shall include provisions preventing cancellation or non-renewal without at least 45-days prior notice to the Owner and Owner shall forward such notice to the State within seven days of the Owner's receipt of such notice.
12. Subrogation Waiver. All insurance policies shall include clauses stating that each carrier shall waive all rights of recovery, under subrogation or otherwise, against Owner or the State, its agencies, institutions, organizations, officers, agents, employees, and volunteers.

Add the following new paragraphs immediately after Paragraph GC-6.03.J:

K. The insurance required by this paragraph shall include the specific coverages and be written for not less than the limits of liability and coverages specified or required by Law, whichever is greater.

1. Workers' Compensation Statutory:..... $500,000
2. Employer's Liability:

   Each Person $100,000
3. Commercial General Liability:

   Bodily Injury (including completed operations & products liability):

   Each occurrence..... $1,000,000

   General Aggregate..... $1,000,000

   Products and Completed Operations Aggregate $1,000,000

   Any One Fire $50,000

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Property Damage:

Each occurrence $1,000,000

General Aggregate $1,000,000

Products and Completed Operations Aggregate $1,000,000

Any One Fire.....$50,000

4. Property Damage Liability

   Insurance will provide explosion, collapse and underground coverages where applicable.

5. Commercial Automobile Liability

   Bodily Injury:

   Each Person.....$1,000,000

   Each Occurrence $2,000,000

   Property Damage:

   Each occurrence $1,000,000

   Or a combined single limit of.....$2,000,000

6. Umbrella Liability Insurance

   Per Occurrence.....$5,000,000

   Annual Aggregate.....$2,000,000

7. The insurance specified above except Worker's Compensation and Employer's Liability shall be endorsed to include the Owner and Engineer as additional insureds thereunder.

L. The commercial general liability insurance shall include completed operations insurance and premises/operations insurance. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be cancelled, materially changed, or refused until at least thirty days' prior written notice has been given to Owner and Engineer by certified mail. All such insurance shall remain in effect until final payment and at all times thereafter when Contractor may be correcting, removing or replacing defective Work in accordance with General Conditions 14.03 – Defective Work. In addition, Contractor shall maintain such completed operations insurance for at least two years after final continuation of such insurance at final payment and one year thereafter.

M. The property and damage liability coverage under this policy shall contain no exclusion (commonly referred to as XC&U exclusion) relative to blasting, explosion, collapse of buildings or damage to underground property. This policy shall provide Broad Form Property Damage coverage.

N. This insurance shall include Independent Contractors Protective Liability coverage.

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O. Contractual Liability Insurance: The commercial general liability insurance required by Paragraph SC-6.03 shall include contractual liability insurance applicable to Contractor's obligations under General Conditions 5.02 – Use of Site and Other Areas, 7.07 – Patent Fees and Royalties and 7.11 – Record Documents. The insurance required by this paragraph shall be written for not less than the limits of liability and coverages specified.

Bodily Injury:

Each Occurrence $2,000,000

Property Damage:

Each occurrence $1,000,000

Or a combined single limit of $2,000,000

SC – 6.04. Owner's Liability Insurance

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

A. Contractor shall be responsible for purchasing and maintaining Owner's protective liability insurance naming the Owner and Engineer as named insured.

B. This insurance shall have the same limits of liability as the Commercial General Liability Insurance and shall protect Owner and Engineer against any and all claims and liabilities for injury to or death of persons, or damage to property caused in whole or in part by, or alleged to have been caused in whole or in part by, the negligent acts or omissions of Contractor or Subcontractors or any agent, servant, worker or employee of Contractor or Subcontractor arising from the operations or Work hereunder.

Bodily Injury Property Damage:

Each occurrence $100,000

Or a combined limit per occurrence $800,000

C. This insurance may be provided by endorsement to Contractor's Commercial General Liability Insurance Policy.

SC – 6.05. Property Insurance

SC-6.05.A. Delete Paragraphs GC-6.05.A in its entirety and insert the following in its place:

A. Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof.

1. This insurance shall:

   a. include the interests of Owner, Contractor, Subcontractors, Engineer and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

   b. Not Used.

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c. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

d. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

e. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

f. allow for partial utilization of the Work by Owner;

g. include testing and startup; and

h. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

2. Contractor shall be responsible for any deductible or self-insured retention.

3. The policies of insurance required to be purchased and maintained by Contractor in accordance with this Paragraph SC-6.05.A shall comply with the requirements of Paragraph 6.05.B – Notice of Cancellation or Change of the General Conditions.

4. Contractor shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

SC - 7.06. Concerning Subcontractors, Suppliers, and Others

SC-7.06.D. Delete Paragraph GC-7.06.D in its entirety and insert the following in its place:

D. Each Bidder shall supply with the Bidding Documents the information identified in Section C-200 – Instructions to Bidders, Article 15 – Submittal of Bid and Article 7 – Attachments to this Bid. The List of Subcontractors shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, entity or individual proposed for portions of the Work. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may,

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

SC - 10.03. Resident Project Representative

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.
    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.

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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 19 – CHAPTER 13, ARTICLE 1, SECTION 21 – RESIDENT VETERAN APPLICATION OF PREFERENCES. (EFFECTIVE JULY 1, 2022.) (2012).

Add the following new paragraphs immediately after Article 18.

A. For the purposes of this section:

1. "business" means a commercial enterprise carried on for the purpose of selling goods or services, including growing, producing, processing or distributing agricultural products;

2. "formal bid process" means a competitive sealed bid process;

3. "formal request for proposals process" means a competitive sealed proposal process, including a competitive sealed qualifications-based proposal process;

4. "public body" means a department, commission, council, board, committee, institution, legislative body, agency, government corporation, educational institution or official of the executive, legislative or judicial branch of the government of the state or a political subdivision of the state and the agencies, instrumentalities and institutions thereof, including two-year post-secondary educational institutions, school districts, local school boards and all municipalities, including home-rule municipalities;

5. "resident business" means a business that has a valid resident business certificate issued by the taxation and revenue department pursuant to Section 13-1-22 NMSA 1978; and

6. "recycled content goods" means supplies and materials composed twenty-five percent or more of recycled materials; provided that the recycled materials content meets or exceeds the minimum content standards required by bid specifications.

B. When a public body makes a purchase using a formal bid process, the public body shall deem a bid submitted by a resident business to be five percent lower than the bid actually submitted.

C. When a public body makes a purchase using a formal request for proposals process:

1. five percent of the total weight of all the factors used in evaluating the proposals shall be awarded to a resident business based on the resident business possessing a valid resident business certificate; or

2. if the contract is awarded based on a point-based system, a resident business shall be awarded the equivalent of five percent of the total possible points to be awarded based on the resident business possessing a valid resident business certificate.

D. When a joint bid or joint proposal is submitted by both resident and nonresident businesses, the resident business preference provided pursuant to Subsection B or C of this section shall be reduced in proportion to the percentage of the contract, based on the dollar amount of the goods or services provided under the contract, that will be performed by a nonresident business as specified in the joint bid or proposal.

E. When bids are received for both recycled content goods and non-recycled content goods, the public body shall deem the bids submitted for recycled content goods of equal

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quality to be five percent lower than the bids actually submitted. A bid calculation pursuant to this subsection for a resident business shall not also receive the bid calculation preference pursuant to Subsection B of this section.

F. The procedures provided in Sections 13-1-172 through 13-1-183 NMSA 1978 or in an applicable purchasing ordinance apply to a protest to a public body concerning the awarding of a contract in violation of this section.

G. This section shall not apply when the expenditure includes federal funds for a specific purchase.

History: 1978 Comp., § 13-1-21, enacted by Laws 1979, ch. 72, § 1; 1981, ch. 104, § 1; 1988, ch. 84, § 1; 1989, ch. 310, § 1; 1995, ch. 60, § 1; 1997, ch. 1, § 2; 1997, ch. 2, § 2; 1997, ch. 3, § 1; 2000, ch. 41, § 1; 2011 (1st S.S.), ch. 3, § 1; 2012, ch. 56, § 1; repealed and reenacted by Laws 2012, ch. 56, § 2.

ARTICLE 20 – CHAPTER 13, ARTICLE 4, SECTION 2 – RESIDENT CONTRACTOR APPLICATION OF PREFERENCE. (EFFECTIVE JULY 1, 2022.) (2012).

Add the following new paragraphs immediately after Article 19.

A. For the purposes of this section:

1. "formal bid process" means a competitive sealed bid process;
2. "formal request for proposals process" means a competitive sealed proposal process, including a competitive sealed qualifications-based proposal process;
3. "public body" means a department, commission, council, board, committee, institution, legislative body, agency, government corporation, educational institution or official of the executive, legislative or judicial branch of the government of the state or a political subdivision of the state and the agencies, instrumentalities and institutions thereof, including two-year post-secondary educational institutions, school districts, local school boards and all municipalities, including home-rule municipalities;
4. "public works contract" means a contract for construction, construction management, architectural, landscape architectural, engineering, surveying or interior design services; and
5. "resident contractor" means a person that has a valid resident contractor certificate issued by the taxation and revenue department pursuant to Section 13-1-22 NMSA 1978.

B. For the purpose of awarding a public works contract using a formal bid process, a public body shall deem a bid submitted by a resident contractor to be five percent lower than the bid actually submitted.

C. When a public body awards a contract using a formal request for proposals process:

1. five percent of the total weight of all the factors used in evaluating the proposals shall be awarded to a resident contractor based on the resident contractor possessing a valid resident contractor certificate; or

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2. if the contract is awarded based on a point-based system, a resident contractor shall be awarded the equivalent of five percent of the total possible points to be awarded based on the resident contractor possessing a valid resident contractor certificate.

D. When a joint bid or joint proposal is submitted by both resident and nonresident contractors, the resident contractor preference provided pursuant to Subsection B or C of this section shall be reduced in proportion to the percentage of the contract, based on the dollar amount of the goods or services provided under the contract, that will be performed by a nonresident contractor as specified in the joint bid or joint proposal.

E. The procedures provided in Sections 13-1-172 through 13-1-183 NMSA 1978 or in an applicable purchasing ordinance apply to a protest to a public body concerning the awarding of a contract in violation of this section.

History: 1978 Comp., § 13-4-2, enacted by Laws 1984, ch. 66, § 2; 1988, ch. 84, § 3; 1989, ch. 310, § 2; 1997, ch. 1, § 3; 1997, ch. 2, § 3; 2001, ch. 174, § 1; 2011 (1st S.S.), ch. 3, § 5; 2012, ch. 56, § 5; repealed and reenacted by Laws 2012, ch. 56, § 6.

ARTICLE 21 – CHAPTER 13, ARTICLE 4, SECTION 31 – SHORT TITLE.

Add the following new paragraphs immediately after Article 20.

A. Sections 1 through 12 [13-4-31 to 13-4-42 NMSA 1978] of this act may be cited as the "Subcontractors Fair Practices Act". For detailed information, please see the State of New Mexico Procurement Code, 2012 Replacement Pamphlet.

History: Laws 1988, ch. 18, § 1. Meaning of "this act". – The term "this act" refers to Laws 1988, Chapter 18 §§ 1 to 12 of which appears as 13-4-31 to 13-4-42 NMSA 1978. Section 13 of Laws 1988, Chapter 18 appears as 13-4-43 NMSA 1978.

1. In Summary, payment and performance bonds must be prepared and submitted by the Prime Contractor and first tier subcontractors only. Subcontractors bonds are to be payable to the Prime Contractor, not the owner.

ARTICLE 22 – NEW MEXICO PUBLIC WORKS PROJECT REQUIREMENTS.

Add the following new paragraphs immediately after Article 21.

A. All Contractors must be actively registered with the Labor Relations Division, Labor Enforcement Fund (LEF) prior to bidding.

B. All Subcontractors, whose portion of the work exceeds $60,000, must be actively registered with the Labor Relations Division, Labor Enforcement Fund (LEF) prior to bidding.

C. Subcontractors must submit bi-weekly certified payrolls to the General Contractor.

D. Contractor must submit bi-weekly certified payrolls to the Owner/Contracting Agency.

E. NM Apprenticeship and Training Fund payments are to be paid either to an approved Apprenticeship program or to the Labor Relations Division.

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F. The Wage Rate poster, provided by the Labor Relations Division, must be displayed at the job site in an easily accessible place.

G. Upon project completion, the Affidavits of Wages Paid (AWP) must be sent to the Contracting Agency.

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C-900 - ADDENDUM

Addendum No. ____

Date: _____

Issued To: _____

From: FEI Engineers, Inc.

Project: Kachina Water Storage Tank

This Addendum forms a part of the Contract for the project above. The original Contract Documents and any prior Addenda remain in full force and effect except as modified by the following which shall take precedence over any contrary provisions in the prior documents.

Each Bidder shall acknowledge receipt of this Addendum by affixing his signature below, by noting this Addendum on his Bid Form and attaching this Addendum acknowledgment page to his Bid.

The undersigned acknowledges receipt of this Addendum and the Bid submitted is in accordance with information, instructions and stipulations set forth herein.

BIDDER

Firm's Name

By: _____ _____

Signature Date

_____ _____

Print Name Title

DESCRIPTION

A. This addendum forms a part of the Bidding and Contract Documents and clarifies, corrects or modifies the Project Manual and Drawings as described below.

B. This addendum consists of (No.) pages and the following attachments:
   1. Attachment (specification) - (Description)
   2. Attachment (drawing) - (Description), etc.

QUESTIONS

A. Question 1
   1. Response: Answer to Question

B. Question 2
   1. Response: Answer to Question

C. Question 3, etc.
   1. Response: Answer to Question

PROJECT MANUAL

A. BIDDING REQUIREMENTS
   1. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :
   2. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :

B. DIVISION 0 – BIDDING / CONTRACT DOCUMENTS
   1. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :
   2. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :

C. DIVISION 01—GENERAL REQUIREMENTS
   1. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :
   2. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :

D. DIVISION, ETC.
   1. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :
   2. Section (No.): (Title)
      a. (Section No.), Page (No.), Item Level (i.e. A.2.a) - (change to read), (add), (delete) :

CONTRACT DRAWINGS

E. REVISIONS TO DRAWINGS
   1. Sheet No. (No.) of (Total No.): (Sheet Title)
      a. (Description of Change) :

F. NEW DRAWINGS
   1. Sheet No. (No.) of (Total No.): (Sheet Title)
      a. (Description of New Drawing):

END OF ADDENDUM

This page intentionally blank.

C-940 - CHANGE ORDER DIRECTIVE

Work Change Order Directive No. _____

Owner: Village of Taos Ski Valley

Contractor: _____

Engineer: FEI Engineers, Inc.

Project: Kachina Water Storage Tank

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

Description:

Attachments:

Purpose for Work Change Directive:
Directive to proceed promptly with the Work described herein, prior to agreeing to changes on Contract Price and Contract Time, is issued due to: *[check one or both of the following]*

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

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

Contract Price $ _____ [increase] [decrease].

Contract Time _____ calendar days [increase] [decrease].

Basis of estimated change in Contract Price:

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

C-940, Work Change Directive.
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RECOMMENDED:

By: _____

Engineer (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

ACCEPTED:

By: _____

Owner (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

RECEIVED:

By: _____

Contractor (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

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C-941 - CHANGE ORDER

Change Order No. _____

Owner: Village of Taos Ski Valley

Contractor: _____

Engineer: FEI Engineers, Inc.

Project: Kachina Water Storage Tank

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

Description:

Attachments:

CHANGE IN CONTRACT PRICE	CHANGE IN CONTRACT TIMES *[note changes in Milestones if applicable]*
Original Contract Price: $_____	Original Contract Times: _____ Substantial Completion: _____ Ready for Final Payment: _____ calendar days or dates
[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: $_____	[Increase] [Decrease] from previously approved Change Orders No. ___ to No. ___: Substantial Completion: _____ Ready for Final Payment: _____ calendar days
Contract Price prior to this Change Order: $_____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ calendar days or dates
[Increase] [Decrease] of this Change Order: $_____	[Increase] [Decrease] of this Change Order: Substantial Completion: _____ Ready for Final Payment: _____ calendar days or dates
Contract Price incorporating this Change Order: $_____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for Final Payment: _____ calendar days or dates

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RECOMMENDED:

By: _____

Engineer (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

ACCEPTED:

By: _____

Owner (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

RECEIVED:

By: _____

Contractor (Authorized Signature)

Print Name: _____

Title: _____

Date: _____

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C-942 - FIELD ORDER

Field Order No. _____

Owner: Village of Taos Ski Valley

Contractor: _____

Engineer: FEI Engineers, Inc.

Project: Kachina Water Storage Tank

Contractor is hereby directed to promptly execute this Field Order, issued in accordance with General Conditions Paragraph 11.01, 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(s) Drawing(s) / Detail(s)

Description:

Attachments:

CONTRACTOR	**ENGINEER**
Contractor's Name	Engineer's Name
By: _____	By: _____
Signature	Signature
_____	_____
Date	Date
_____	_____
Print Name	Print Name
_____	_____
Title	Title

Copy to: Owner

EJCDC® C-942, Field Order.
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16420 Motor Controls
16442 Electrical Panelboards
16472 Surge Suppressive Devices
16670 Light Fixtures
16903 Programmable Logic Controllers

TECHNICAL DATA
Preliminary Geotechnical Engineering Services for Kachina Water Storage Tank by Geo-Test, Inc., December 9, 2015.

CERTIFICATION
Responsible In Charge DIVISIONS 1 through 16

SECTION 01110 - SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY:

A. This Section summarizes the Work of the Project as covered in detail in the complete Contract Documents.

1.2 PROJECT DESCRIPTION:

A. The Village of Taos Ski Valley will be constructing a water storage tank, Kachina Tank, to include the following components:

1. Site Preparation: Install erosion control best management practices. Install silt fence along the limit of disturbance in order to provide erosion control and to indicate the construction boundary.

   Clearing and grubbing shall be performed, minimized to the extent necessary to complete the Work, and may not extend outside the Construction Easements.

   Provide all temporary barriers and controls, utilities and facilities, and signage are required.

2. Trail Relocation: Relocation of the existing Williams Lake hiking trail to avoid conflict with proposed access road and tank site. The lower proposed relocated trail section already exists as a side trail. Work includes blocking off the trail section that conflicts with the proposed access road and installing signage to direct hikers to the other existing trail section. For the upper trail section, the relocated section does not exist. Work for this section includes clearing, grubbing, and surface preparation of the new trail alignment with additional features to discourage hikers from utilizing the existing trail alignment.

3. Access Road: Construction of approximately 1050 linear feet of new gravel access road from the bottom of Blue Jay Ridge Road up to the tank site. Work includes grading of the road and utilization of screened and compacted native material to prepare the road base. Work includes drainage features such as roadside swales and culverts.

4. Waterline and Dry Utilities: Installation of new 8 inch ductile iron pipe waterline and valves, electric, and fiber along the proposed access road, connecting to the existing stubs in Blue Jay Ridge Road and continuing approximately 900 linear feet to the proposed tank site.

5. Kachina Tank: Construction of a reinforced concrete below grade storage tank with approximate working volume of 250,000 gallons. The tank is approximately 42.5 feet by 62.5 feet by 18 feet tall. The tank site will require clearing, grubbing, and excavation to allow for cast-in-place concrete to construct the tank. Provide cast-in-place reinforced concrete tank with association piping connections, inside piping, level measurement devices, ladders, hatches, mixers and other appurtenances. Work includes perimeter

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drain, geotextiles, and structural backfill. After the tank is constructed, cured, and leak tested, the site will be backfilled and graded to tie-in to the existing grade and blend into the existing topography. All disturbed areas shall be topsoil and seeded.

6. Control Valve Vault: Construction of a cast-in-place concrete control valve vault, connection of waterline pipes to the vault, and installation of control valves, flow meter, and related appurtenances. Work includes the structure, piping and appurtenances, electrical and controls.

7. Yard Piping: Installation of tank drain, foundation perimeter drain, overflow piping, connecting to a proposed manhole structure, and overflow/drain piping to daylight. Work includes all associated trench, backfill, compaction, and erosion control.

8. Controls: The tank level will be controlled and monitored using pressure transmitters. Tank level data will be conveyed to a PLC. Based on the tank levels, the Kachina booster pumps will be turned on and off. Additional controls include butterfly valve isolation of tank chamber No. 2 with low pressure automatic open and operator overrides. Work includes connection of the level pressure sensors, pump controls, butterfly valve controls, and tie into the existing SCADA system located at the Wastewater Treatment Facility (WWTF).

9. All associated general, civil, architectural, structural, mechanical, process, electrical/instrumentation and controls necessary for the project.

1.3 WORK INCLUDED IN THE PROJECT:

A. Contractor's work included in the project is to provide and install all materials, accessories, and appurtenances required for the new completely functioning water storage tank as identified in the Contract Documents. This includes, but is not limited to, all earthwork/site work, yard piping, process equipment and piping, electrical and instrumentation/controls, architectural, piping, valves, fittings, and miscellaneous appurtenances required to successfully complete the project.

1.4 WORK BY OTHERS AND PROJECT COORDINATION:

A. Work To Be Completed By Owner: Onsite geotechnical investigations and finalization of the Geotechnical Report will be performed by Geo-Test and paid for by the Owner. Any revisions to the structural design of the tank will be performed by FEI Engineers and their associated subconsultants; this work will be paid for by the Owner.

B. Project Coordination: Contractor is responsible for coordination of work with Owner and Engineer.

C. Work Under Other Contracts: Contractor shall coordinate construction activities with the other contractors in this general vicinity.

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1.5 CONTRACTOR'S USE OF PREMISES:

A. Exclusive Use: Not Used.

B. Limited Use:

1. During the construction period, Contractor shall have full use of the premises for execution of the Work. Use of premises is limited only by Owner's right to perform duties and functions as stated in the GENERAL CONDITIONS and in this Section.

2. Confine operations to areas within Contract limits indicated. Portions of the Site beyond areas in which construction operations are indicated are not to be disturbed.

3. Coordinate with other separate contractors and Owner to avoid interference of operations.

4. Conduct operations as to ensure the least inconvenience to Owner and the general public. This shall include coordination with Owners staff for operation of the adjacent facilities.

1.6 OWNER'S USE OF PREMISES:

A. Partial Owner Occupancy: The Owner reserves the right to occupy the Site prior to Substantial Completion for use. Partial occupancy and testing of the constructed facilities shall not constitute acceptance of the Work.

1.7 WORK SEQUENCE:

A. General: Construction sequence shall be determined by Contractor subject to Owner's approval.

B. Prior to commencing tank construction, Contractor shall coordinate with Geo-Test to access the site, conduct an on-site geotechnical investigation, and finalize their geotechnical report. This work must be completed with sufficient time to allow for finalization of the report, review by the Engineer, revisions to the structural tank design as necessary, and notification to the New Mexico Environment Department (NMED) all before the tank portion of the construction commences.

C. Prior to tank construction, the concrete must be tested show to compliance with NSF standards. This work should be started with sufficient time to allow for concrete cylinder cure time, soaking of the concrete cylinders in system water, water sampling, laboratory testing, report preparation, and submittal and review from the NMED. All of this work must be complete before commencing any tank concrete work.

D. The trail must be relocated prior to commencing construction on the access road and tank site.

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E. Erosion control measures shall be installed prior to clearing and grubbing and shall be maintained throughout the entire construction sequence.

F. Contractor shall coordinate with the Engineer to have quality control testing services (Geotechnical Allowance) on site when requested by Owner.

G. Contractor shall ensure all utilities are located and potholed as defined in the Contract Documents prior to beginning work.

H. Any shutdown of existing utilities to perform the Work shall be held to a minimum length of time and shall be coordinated with Utility who shall have control over the timing and schedules of such shutdowns.

1.8 MEASUREMENT AND PAYMENT:

A. Lump Sum Contract: All Work indicated on the Contract Drawings and specified in the Contract Documents shall be included in the "Schedule of Values" in the Bid Form and SECTION 01270 – Definition of Schedule of Values.

1.9 COPIES OF DOCUMENTS:

A. Copies of the Contract Documents will be furnished in accordance with the requirements of the General Conditions.

B. Additional Copies: Additional copies of above documents will be supplied by Engineer upon request (at printing and delivery cost).

1.10 LIST OF DRAWINGS (AND SCHEDULES):

A. Contract Drawings:
   1. Each sheet of the Contract Drawings bears the following general title: Kachina Water Storage Tank Project.
   2. Individual sheet numbers and titles are as stated on index sheet under "Contract Drawings".

1.11 PERMITS AND LICENSES:

A. Owner shall obtain, at Owner’s expense, all Village and County permits and licenses necessary for the construction of the Work.

B. All other permits required for construction of this Project shall be obtained by the Contractor in accordance with the GENERAL CONDITIONS.

1.12 UNDERGROUND UTILITIES:

A. Any known sewers, water mains, gas mains, telephone conduits, electric cables, and other underground structures are shown on the Drawings only to the extent such information has been made available to or discovered by the Engineer. It is expected

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that there may be discrepancies and omissions in the location and quantities of utilities and structures shown. This information is shown for the convenience of the Contractor, but is not guaranteed to be either correct or complete and all responsibility for the accuracy and completeness thereof is expressly disclaimed by Owner and Engineer. The Contractor shall make such investigation as he thinks necessary to verify its correctness and completeness. The Contractor shall, ahead of excavation, locate all underground utilities and structures so that they will not be accidentally damaged by his construction operation.

B. Contractor shall be responsible for contacting all utilities concerning location of all above and below ground facilities before proceeding with the Work.

C. Contractor is responsible for potholing all existing utilities to be crossed no later than 48 hours prior to making crossing.

1.13 SPECIAL CONSIDERATIONS:

A. Owner shall be responsible for negotiations of any waivers or alternate arrangements required to enable transportation of materials to the Site.

B. Contractor shall maintain conditions of access road to site such that access is not hindered as the result of construction-related deterioration.

C. Prepare and submit an erosion control plan within 10 days of Notice to Proceed.

D. The water system components shall comply with NSF / ANSI 61 ("Drinking Water System Components - Health Effects"), respectively.

1.14 HISTORICAL AND ARCHAEOLOGICAL:

A. If during the course of construction, evidence of deposits of historical or archaeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Owner. No further disturbance of the deposits shall ensue until the Contractor has been notified by the Owner that Contractor may proceed. Compensation to the Contractor, if any, for lost time or changes in construction resulting from the find, shall be determined in accordance with changed or extra work provisions of the Contract Documents.

1.15 QUALITY CONTROL TESTING:

A. Payment for Soil, Concrete and Other Testing:
   1. Soils and Concrete Testing: The Contractor shall pay for concrete, asphalt, and soils tests on the Project up to the maximum allowance amount. Costs of corrective action, costs of failing soils and concrete tests, and costs of testing associated with establishment of mix design are the sole responsibility of the Contractor.
   2. Required testing, testing procedures, reports, certificates, and costs associated

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with all phases of securing required satisfactory test information which may be required by individual sections of Specifications or Drawings are the full responsibility of the Contractor.

3. Quality control testing laboratory shall be selected by the Owner and all associated costs paid by Contractor.

1.16 CONSTRUCTION SURVEYING:

A. Contractor shall furnish and set construction stakes establishing all lines, grades, and measurements necessary to the prosecution of the Work contracted under these Specifications. Construction stakes shall also clearly define limits of construction and site access as defined on the Drawings. Additional surveying required for construction of the Project shall also be provided by the Contractor. Contractor shall also be required to complete all necessary surveying for record drawings to be provided to the Engineer prior to final payment. All surveying shall be conducted under direct supervision of a land surveyor registered in the State of New Mexico.

1.17 HOURS OF WORK:

A. Without prior written authorization, Contractor shall limit work hours to 7:00 a.m. to 5:00 p.m., Monday through Friday, and 8:00 a.m. to 5:00 p.m., Saturday with written consent from the Owner. Other than small engines necessary for on-going continuous maintenance requirements (for example, dewatering pumps), no machinery engines shall run, or other activities generating appreciable noise allowed, outside of the hours stated herein. Contractor shall not perform work on Sunday or holidays.

1.18 WARRANTY PERIOD:

A. All Work completed under this Contract shall have a one (1) year correction period. Requirements of the correction period are described in the GENERAL CONDITIONS.

1.19 SOILS INFORMATION:

A. Contractor may request copies of the Preliminary Geotechnical Report as outlined in the Instructions to Bidders.

B. The report of subsurface conditions at the site has been used by the Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such reports but not upon non-technical data, interpretations or opinion contained therein or the completeness thereof for the purposes of bidding or construction. The report and drawings contained within are not part of the Contract Documents.

C. The geotechnical report will be finalized during the Construction phase. The Contractor shall coordinate with Geo-Test and provide access to the site so that Geo-Test can conduct an onsite investigation and finalize the Geotechnical Report.

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D. Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies, and obtain any additional information and data which pertain to the physical conditions, surface or subsurface, at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION - NOT APPLICABLE

END OF SECTION

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SECTION 01120 - ALLOWANCES

PART 1 GENERAL

1.1 SUMMARY:

A. This section specifies administrative and procedural requirements governing handling and processing of Allowances.

B. Types of Allowances:
   1. NSF compliance testing for concrete
   2. Quality control testing services allowance

1.2 SELECTION AND PURCHASE:

A. NSF compliance testing: Contractor shall utilize Western Technologies, Inc. for third party performance of the NSF compliance testing for the concrete. Contact Andrew L. Cuaderes, Sr. Vice President/Managing Director, 8305 Washington Place NE - Albuquerque NM 87113, (505) 823-4488 email: a.cuaderes@wt-us.com

B. Quality control testing services: Owner shall select a Quality Control Laboratory to be paid for by Contractor. Owner or Resident Project Representative shall contact selected testing laboratory to request quality control testing services.

1.3 SUBMITTALS:

A. Submit invoices or delivery slips to indicate actual costs of services, and other Owner directed items, provided at the Site for use in fulfillment of each Allowance.

1.4 NSF COMPLIANCE TESTINGS:

A. Use the NSF compliance testing services allowance to provide NSF compliance testing of the concrete as required by the New Mexico Environment Department in accordance with the NSF standard practices and requirements. Costs for re-testing work for failed test results shall be paid for directly by the Contractor and are not to be included in the allowance.

B. At Contract closeout, credit unused amounts remaining allowance to the Owner by Change Order.

1.5 QUALITY CONTROL TESTING SERVICES ALLOWANCES:

A. Use the quality control testing services allowance as directed by the Engineer and Owner to provide quality control testing for soils, crushed rock, concrete and masonry. Costs for re-testing work with failed test results shall be paid for directly by the Contractor and are not to be included in the allowance.

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B. At Contract closeout, credit unused amounts remaining in the quality control testing services allowance to the Owner by Change Order.

PART 2 PRODUCTS - NOT APPLICABLE.

PART 3 EXECUTION

3.1 PREPARATION:

A. Coordinate materials, equipment, and their installation for each allowance with related materials, equipment and installations to ensure that each allowance item is completely integrated and interfaced with related construction activities.

3.2 SCHEDULE OF ALLOWANCES:

A. Allowance No. 1: Include an allowance for NSF compliance testing of the concrete by Western Technologies Inc. Time for coordination provided by the Contractor and subcontractors is not included in this allowance.

B. Allowance No. 2: Include an allowance for quality control testing services to provide quality control testing for soils, crushed rock, concrete and masonry. An independent testing laboratory will be selected by Owner and paid for by Contractor.

END OF SECTION

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SECTION 01270 - SCHEDULE OF VALUES

PART 1 GENERAL

1.1 SUMMARY

A. This Section explains, in general, what is and what is not included in a section item, and the limits or cut-off points where one bid item ends and another begins.

B. The Total Base Bid shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the lump sum prices bid. All work not specifically set forth as a pay item in the Bid Section shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the bid.

1.2 LUMP SUM BID

A. Section No. 1 – Bonding, Mobilization, and Insurance:
   1. The lump sum price for this item shall include all costs for bonds, insurance, permits, temporary utilities, establishing a field office and other necessary facilities, moving construction equipment to the site, and all other costs incurred or labor and operations which must be performed prior to beginning the other items under the contract.
   2. Payment will be according to NMDOT formula for mobilization. Price shall not exceed 5% of the total price.

B. Section No. 2 – Site Work:
   1. This bid item consists of all Work related to site preparation and earthwork required for the construction of the water storage tank and associated structures. It includes the all necessary clearing and grubbing, grading, placement of stacked boulder walls, excavation, dewatering, erosion control, backfill and compaction for the tank and utility structures, and drainage materials, and all site grading, including topsoiling and seeding, and ancillary work not specifically identified. Work includes grading of the site as shown on the Drawings including proposed drainages. Work includes protection of all trees outside the construction limits. Work includes any hauling required and the furnishing of structural and other fill and the handling of all excavated material on the Site.
   2. Payment will be made on a lump sum basis.

C. Section No. 3 – Trail Relocation:
   1. This bid item consists of all Work related to relocation of the existing Williams Lake hiking trail to avoid conflict with proposed access road and tank site. The

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lower proposed relocated trail section already exists as a side trail. Work includes blocking off the trail section that conflicts with the proposed access road and installing signage to direct hikers to the other existing trail section, and ancillary work not specifically identified. For the upper trail section, the relocated section does not exist. Work for this section includes clearing, grubbing, and surface preparation of the new trail alignment with additional features to discourage hikers from utilizing the existing trail alignment, and ancillary work not specifically identified.

At intersections of the proposed and existing trail, a section of the existing trail shall be regraded and revegetated, with installation of logs crossing the old trail section. Directional trail signs shall also be installed at these intersections to direct hikers along the new trail section. Work shall include clearing, grubbing, grading, furnishing of fill, compaction, and handling of excavated and grubbed material, and appurtenances work not specifically identified.

2. Payment will be made on a lump sum basis.

D. Section No. 4 – Waterline:

1. This bid item consists of all Work related to the new 8 inch ductile iron pipe connecting from the existing stub on Blue Jay Ridge Road up to the new storage tank and connection to the control vault and tank. The work includes the furnishing, handling and installation of the water piping, valves, fittings, joint restraint, marker tape, tracer wire, miscellaneous structures, and appurtenances not specifically identified. The work shall include tie-in to the existing waterline and tie-in to the proposed control vault and tank. Work includes testing and disinfection of the proposed waterline. Work includes trench excavation, bedding, and backfill. Work includes any hauling required, the furnishing of bedding and backfill, and the handling of all excavated material on the Site.

2. Payment will be made on a lump sum basis.

E. Section No. 5 – Dry Utilities:

1. This bid item consists of all Work related to the installation of fiber and electric connecting from the existing stub on Blue Jay Ridge Road up to the new storage tank and connection to the control vault and tank. The work includes the furnishing, handling and installation of the conduits, electric service line, fittings, marker tape, miscellaneous structures, pull boxes, and appurtenances not specifically identified. The Contractor is responsible for coordination with the utility providers and completion of the work in accordance with the utility providers' requirements.

   The work shall include tie-in to the existing electrical and fiber conduits and tie-in to the proposed control vault. For fiber conduit, work includes trench excavation, bedding, backfill, compaction and coordination with fiber provider for installation of the fiber conduit cable. For electrical service, work includes trench, excavation, bedding, backfill, compaction, placement of conduit, installation of electrical wire, and tie-in.

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Work includes any hauling required, the furnishing of bedding and backfill, and the handling of all excavated material on the Site.

2. Payment will be made on a lump sum basis.

F. Section No. 6 – Access Road:

1. This bid items consists of all Work related to construction of the access road from the existing Blue Jay Ridge Road up to the tank site as delineated on the Drawings and ancillary work not specifically identified. Work includes clearing, grubbing, excavation, subsurface preparation, and aggregate subgrade and surfacing placement and compaction. Work includes grading associated with preparation and maintenance of the stormwater prevention plan, site fencing, waddles, roadside swales and installation of a drainage culverts. Work associated with the culverts includes furnishing, handling and installation the culverts and end sections, excavation, backfill and compaction, grading, and placement of riprap at the inlet and outlet. The Work also includes construction of the access road turnaround location near the tank, including grading, excavation, backfill, subsurface preparation, and aggregate subgrade and surfacing placement compaction. Suitable native material excavated from the Site shall be screened and utilized as the aggregate material. Works includes topsoiling and seeding disturbed areas outside the road surface. Work includes installation of bollards and boulders to prevent traffic from entering the tank site. Works includes any hauling required, preparation of excavated materials to use as backfill and aggregate surfacing, the furnishing of fill and aggregate material as necessary, and the handling of all excavated material on the Site.

2. Payment will be made on a lump sum basis.

G. Section No. 7 – Kachina Tank:

1. This bid items consists of all Work related to construction of the proposed 250,000 gallon concrete storage tank including tank floor, sidewalls, internal baffle wall, supports, roof, hatches, vents, and internal piping. This work includes formwork, reinforcement furnishing, handling and placement, furnishing and hauling of concrete, placement of concrete, finish work, concrete curing, and leak testing. Work includes other items associated with the tank such as but not limited to, inlet and outlet piping connection to the tank and within the tank and associated valves, fittings, and supports; and tank access hatches and ladders, tank vent piping and screens, tank sumps, mixers, drain pipes and appurtenances not specifically identified. Work includes leak testing and disinfection.

2. Payment will be made on a lump sum basis.

H. Section No. 8 – Control Valve Vault:

1. This bid items consists of all Work related to construction of the proposed Control Valve Vault. This will include formwork, reinforcement furnishing, handling and placement, furnishing and hauling of concrete, placement of concrete, finish work, and concrete curing; or furnishing and installation of a

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pre-cast concrete structure. Work includes other items associated such as but not limited it, inlet and outlet piping connections to the vault, piping within the vault, associated valves, meters and gauges, fittings, and supports; and vault access hatches and ladder and vent piping, screens and appurtenances not specifically identified .

2. Payment will be made on a lump sum basis.

I. Section No. 9 – Yard Piping:

1. This bid item consists of all Work related to the 8 inch overflow ductile iron piping, 6 inch drain ductile iron piping, tank and vault perimeter drains, 12 inch drain/overflow to outfall structure, concrete outfall structure, and manhole. The work includes the furnishing, handling and installation of the piping, valves, fittings, marker tape, miscellaneous structures, and appurtenances not specifically identified. The pipes shall connect at the manhole. Work includes furnishing, handling, placement of the manhole and related access, frame and lid, steps, grouting, and pipe seal. The work shall include tie-in to the tank, conveyance of pipes to the manhole, and the piping to the concrete outfall structure as shown on the Drawings. Work includes excavation, bedding, and backfill. Work includes any hauling required, the furnishing of bedding and backfill, and the handling of all excavated material on the Site.

2. Payment will be made on a lump sum basis.

J. Section No. 10 – Electrical / Instrumentation and Controls (I&C) Systems:

1. This bid item includes all the Work associated with furnishing and installing the electrical and instrumentation and individual controls systems required for the Kachina Storage Tank, in addition to all associated electrical, instrumentation and controls not specifically identified for the Work. Work includes EI&C required for the pressure level sensor, butterfly valve actuator and controller, flow meter, mixers, and existing pumps. Work includes connection and programming as necessary to tie-in to the existing SCADA system.

2. Payment will be made on a lump sum basis.

K. Section No. 11 – NSF Compliance Testing

1. An allowance for NSF compliance testing of the concrete as required by the New Mexico Environment Department in accordance with the NSF standard practices and requirements. Testing services to be provided by Western Technologies, Inc. Testing shall be performed using the specified concrete mix and the materials from the Contractor's proposed supplier. The test cylinders shall include the aggregate, cement, and admixtures as will be utilized for the tank construction. Costs for re-testing work for failed test results shall be paid for directly by the Contractor and are not to be included in the allowance. Contractor to provide invoices with Contractor's Applications for Payment. At Contract closeout, credit unused amounts remaining in the allowance to the Owner by Change Order.

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L. Section No. 12 - Geotechnical Allowance:

1. An allowance for a quality control testing services allowance to provide quality control testing for soils, crushed rock, concrete and masonry. An independent testing laboratory will be selected by Owner and paid for by Contractor. Costs for re-testing work with failed test results shall be paid for directly by the Contractor and are not to be included in the allowance. Contractor to provide testing laboratory's invoices with Contractor's Applications for Payment. At Contract closeout, credit unused amounts remaining in the quality control testing services allowance to the Owner by Change Order.

1.3 ADDITIVE ALTERNATES:

A. Additive Alternate No. 1 – NONE.

1.4 DEDUCTIVE ALTERNATES:

A. Deductive Alternate No. 1 – NONE.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION - NOT APPLICABLE

END OF SECTION

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SECTION 01320 - PROJECT MEETINGS, SCHEDULES AND REPORTS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following administrative and procedural requirements:
   1. Project Meetings:
      a. Preconstruction conference.
      b. Coordination schedules.
      c. Progress meetings.
      d. Coordination meetings.
   2. Schedules and Reports:
      a. Initial coordination submittals.
      b. Construction progress schedule.
      c. Construction progress reports.
      d. Schedule of values.
      e. Special reports.
      f. List of Subcontractors and major Suppliers.
   3. Related Work Specified Elsewhere:
      a. Schedule of Values: SECTION 01270.
      b. Photographs: SECTION 01325.
      c. Submittals: SECTION 01330.

1.2 PROJECT MEETINGS:

A. Preconstruction Conference:
   1. Engineer will administer a meeting within 10 days after the Commence Times dates as stated in the Notice to Proceed, to review items stated in the following agenda and to establish a working understanding between the parties as to their relationships during conduct of the Work.
   2. Preconstruction Conference Shall Be Attended By:
      a. Contractor and his superintendent.
      b. Engineer and Resident Project Representative if any.
      c. Representatives of Owner.
      d. At Owner's option, representatives of principal Subcontractors and Suppliers.
   3. Agenda:
      a. Construction schedules.
      b. Critical Work sequencing.
      c. Designation of responsible personnel.
      d. Project coordination.
      e. Procedures and Processing of:

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1) Field decisions.
2) Substitutions.
3) Submittals.
4) Change Orders.
5) Applications for payment.

f. Procedures for testing.
g. Procedures for maintaining record documents.
h. Use of Premises:
1) Office, work, and storage areas.
2) Owner's requirements.
i. Construction facilities, controls, and construction aids.
j. Safety and first aid.
k. Security.

4. Location of Meeting: 7 Firehouse Road, Taos Ski Valley, NM 87525.

5. Reporting:

a. Within 5 working days of the meeting, Engineer will prepare and distribute minutes of the meeting to Owner and Contractor.
b. Contractor shall provide copies to Subcontractors and major Suppliers.

B. Coordination Schedules:

1. Engineer will administer a meeting during the first month of construction to finalize the initial coordination schedules requested under Article 1.3 this Section.

2. The meeting shall be attended by:

a. Contractor and his superintendent.
b. At Owner's option, Representatives of principal Subcontractors and Suppliers.
c. Engineer and Resident Project Representative if any.
d. Representatives of Owner.

C. Progress Meetings:

1. Engineer will schedule and administer a meeting a minimum of once each month and at other times requested by Owner. Representatives of the Owner, Engineer, and Contractor shall be present at each meeting. With Engineer's concurrence, Contractor may request attendance by representatives of Subcontractors, Suppliers, or other entities concerned with current program or involved with planning, coordination, or performance of future activities. All participants in the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

2. Contractor and each Subcontractor represented shall be prepared to discuss the current construction progress report and any anticipated future changes to the schedule. Each Subcontractor shall comment on the schedules of Contractor and other Subcontractors and advise if their current progress or anticipated activities are compatible with that Subcontractor's Work.

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3. If one Subcontractor is delaying another, Contractor shall issue such directions as are necessary to resolve the situation and promote construction progress.

4. Agenda:

   a. Review of construction progress since previous meeting.
   b. Field observations, interface requirements, conflicts.
   c. Problems which impede construction schedule.
   d. Off site fabrication.
   e. Delivery schedules.
   f. Submittal schedules and status.
   g. Site utilization.
   h. Temporary facilities and services.
   i. Hours of Work.
   j. Hazards and risks.
   k. Housekeeping.
   l. Quality and Work standards.
   m. Change orders.
   n. Documentation of information for payment request.
   o. Corrective measures and procedures to regain construction schedule if necessary.
   p. Revisions to construction schedule.
   q. Review of proposed activities for succeeding Work period.
   r. Adjacent property owner relations
   s. Review proposed Contract modifications for:
      1) Effect on construction schedule and on completion date.
      2) Other business.

5. Location of Meetings: At or near Project Site.

6. Reporting:

   a. Within 3 working days of each meeting, Engineer will prepare and distribute minutes of the meeting to Owner and Contractor.
   b. Contractor shall distribute copies to principal Subcontractors and Suppliers.

D. Coordination Meetings:

1. Engineer may administer coordination meetings to be attended by Owner or his representative and prime contractors at the Site. Contractor shall participate in such conferences, accompanied by Subcontractors as requested by Engineer.

2. Agenda will be similar to that stated above for Progress Meetings.

1.3 SCHEDULES AND REPORTS:

A. Initial Coordination Schedules:

1. Prepare and submit an erosion control plan within 10 days of Notice to Proceed

2. Within 5 days after the Commence Times dates as stated in the Notice to Proceed, Contractor shall submit to Engineer for review and acceptance:

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a. A preliminary construction progress schedule. The schedule shall show the Work in a horizontal bar chart or other graphic format, and indicate the times (number of days or dates) for starting and completing the various stages of the Work including any milestones specified in the Contract Documents.
b. A preliminary procurement schedule of Equipment and Materials.
c. A preliminary schedule of values for partial pay purposes as identified in Section 01270.
d. A preliminary schedule of Submittals, as stated in Section 01330.

B. Construction Progress Schedule:

1. After submittal of preliminary construction progress schedule as stated above, submit a detailed construction progress schedule within 10 days after the Commence Times dates as stated in the Notice to Proceed. Base the schedule on the preliminary construction progress schedule and incorporate review comments and other feedback. Submit 5 copies to Engineer for review and acceptance.

2. The schedule shall show the Work in a horizontal bar chart or other graphic format suitable for displaying scheduled and actual progress and will preferably include:

   a. The schedule shall indicate phase of the Work; starting date, major milestones, and dates of Substantial Completion and Final Completion.
   b. Breakdown Work phases into separate time bar for each significant construction activity entry, with dates Work is expected to begin and be completed. Within each time bar, indicate estimated completion percentage in 10 percent increments.
   c. Scale and spacing shall allow room for notations and revisions.
   d. Sheet Size: 11" x 17".

3. Provide sub-schedules to define in more detail critical portions of schedules, including inspections and tests.

4. Coordinate construction progress schedule with schedule of values, Submittal schedule, procurement schedule, progress reports, and payment requests.

5. Engineer will review and comment on construction progress schedule and, upon agreement between Engineer and Contractor on necessary changes:

   a. Contractor shall print and distribute 5 copies of the accepted schedule to Engineer. Contractor shall print additional copies for Subcontractors and other parties required to comply with scheduled dates; one copy to each party.

6. Revise the construction progress schedule after each meeting, event, or activity where revisions have been recognized and accepted in accordance with the General Conditions.

7. Update and submit 5 copies to Engineer of the revised schedule at least once every month to show actual progress compared to the originally accepted schedule and any proposed changes in the schedule of remaining Work. Include

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with construction progress report.

C. Construction Progress Reports:
   1. Submit a report on actual construction progress on a weekly basis. More frequent reports may be required should the Work fall behind the accepted schedule.
      a. Submit a weekly report to coordinate with and supplement the monthly construction progress report and which details Work scheduled for the following one-week interval, including:
         1) Work activities which will occur.
         2) Number and size of crews.
         3) Construction equipment on Site.
         4) Major items of Equipment and Material to be installed.
      b. Format shall be on 8-1/2" x 11" paper, submitted to Engineer in 3 copies.
   2. Construction progress reports shall consist of the revised construction progress schedule and a narrative report which shall include but not be limited to the following:
      a. Comparison of actual progress to planned progress shown on originally accepted schedule.
      b. Summary of activities completed since the previous construction progress report.
      c. Identification of problem areas.
      d. A description of current and anticipated delaying factors, if any.
      e. Impact of possible delaying factors.
      f. Proposed corrective actions.
   3. Submit a construction progress report to Engineer with each application for payment. Work reported complete but not readily apparent to Engineer must be substantiated with supporting data when requested by Engineer. Copies of the weekly site photographs (see SECTION 01325) shall be attached to each application for payment.
   4. If a schedule update reveals that, through no fault of Owner, the Work is likely to be completed later than the Contract completion date, Contractor shall establish a plan for making up lost time and submit to Owner and Engineer for review before implementing the plan. All actions necessary to get the Work back on schedule shall be at Contractor's expense.

D. Schedule of Values:
   1. Submit as specified in General Conditions, based on the schedule of values.

E. Special Reports:
   1. When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, response by Contractor's personnel, an evaluation of the results or effects, and similar pertinent information. Advise the Owner in advance when such events

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are known or predictable.

2. Submit original report to Owner and copy to Engineer.

F. List of Subcontractors and Major Suppliers:

1. Contractor shall submit to Owner, at Pre-Construction Conference, a list of all subcontractors and major suppliers complete with contact person, address, telephone number, and fax number for each of them.

PART 2 PRODUCTS NOT APPLICABLE.

PART 3 EXECUTION NOT APPLICABLE.

END OF SECTION

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SECTION 01325 - CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for construction photographs.

1.2 SUBMITTALS:

A. Submit prints as specified in SECTION 01330 - SUBMITTALS and in PART 3 - this Section.

B. Photographer shall submit two sample prints of the type and quality required during construction, for review and acceptance by Engineer.

C. Photographer shall submit two examples of prior work of the type and quality required during performance of Work, for review and acceptance by Engineer.

D. Photographs shall be delivered to Engineer no less than once per month with each Contractor's Application for Payment.

PART 2 PRODUCTS

2.1 PHOTOGRAPHIC REQUIREMENTS:

A. Specified in PART 3, this Section.

PART 3 EXECUTION

3.1 PROGRESS SITE PHOTOGRAPHS:

A. Contractor shall be responsible for photographs of the site to show the existing and general progress of the Work. Engineer will advise as to which views are of interest.
   1. Existing Site conditions before Site Work is started. Number of views shall be adequate to cover the Site.
   2. Progress of the Work from clearing throughout construction. There shall be at least 12 different views taken every week.
   3. Finished Project after completion of Work. Number of views shall be adequate to show the finished Work.
   4. If Project is not completed during the Contract Time, or authorized extensions, photographs shall continue to be taken at no increase in Contract Price.

B. Photographs shall be taken with a digital camera.

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C. Prints shall be color, smooth glossy finish, 4" x 6" inserted into archival quality polypropylene photographic binder pages punched for insertion into 3-ring binder and submitted with each application for payment.

D. Identify all prints on back of each view with a label as to the Contract name and Contract number, name of Contractor, description of view, and date (and time) photograph was taken. Prints shall also bear the photographer's name.

E. Digital archive on a CD or DVD.

F. Deliver prints and CD/DVD to Engineer with each Application for Payment.

3.2 ROUTE PHOTOGRAPHS:

A. Contractor shall be responsible for photographs of the route to show the roadway improvements and pipeline extension. Photographs shall include existing conditions and progress of the work.

3.3 AUDIO/VIDEO RECORDINGS:

A. Audio/video recordings shall be completed before disturbing of the Site is started and shall be submitted to and approved by the Engineer prior to the first application for payment. A second audio/video recording shall be produced after completion of all construction operations, showing the same view or views as close as possible, to illustrate "before" and "after" conditions. This is the responsibility of Contractor. Two day notice shall be given to Engineer and Owner prior to this Work to allow them to accompany photographer.

B. The principal reason for producing videos is so that items such as conditions of site or other problems may be more clearly shown and recorded. This will to some degree preclude the possibility of post construction litigation.

C. All required equipment, accessories, materials, and labor for the timely production of this documentation shall be arranged and furnished through Contractor.
   1. The audio/video system camcorder used by the photographer shall have the following capabilities and features:
      a. Mini DVD format.
      b. Playback capability (in the field) with a B/W viewfinder built in.
      c. HD recording.
      d. Advanced Image Server low-light mode.
      e. 34X optical zoom.
      f. Image stabilization.
   2. The audio/video system shall be capable of producing bright, sharp, clear visual images which render accurate colors free from imperfections and distortions that might obscure recorded information during playback. The simultaneous audio record shall be made directly onto the original tapes, and shall record narration of the photographer clearly and audibly, with adequate volume, free

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from unnecessary interruptions and distortions that might eliminate recorded information during playback.

D. Zone of Influence: Unless otherwise indicated by Engineer or Owner, the "Zone of Influence" which might be affected by the construction operations and, therefore, shall be documented in these a/v recordings, shall be whichever of the following includes the greatest area.

1. All areas within the temporary construction right of ways and grading limits, as indicated on the Contract Drawings.

2. The permanent easement for the completed improvements, as indicated on the Contract Drawings.

3. All areas within 35 feet of the proposed improvements.

E. Audio/Video Production Procedures:

1. It is recommended that the audio/video recordings be produced while actually walking the construction site NOT through the use of wheeled vehicles.

2. All video recordings shall display digital information continuously; this information shall include the current time and date, showing the month, day, and year. This information shall be audibly acknowledged by the photographer at appropriate times during recording sequences.

3. Each recording tape shall begin with a visual of the photographer's name, followed by the current date and time on digital display, plus audible and visual, if possible, indication of Contract name and numbers, municipality, name of Contractor, and other pertinent information. Thereafter, each recording sequence should begin with the current time and date, followed by the location of the photographer, direction of view, and description of the scene being recorded. Continuous updates of this information, plus other pertinent comments, shall be given throughout the recording sequence. Such audio and video records shall include, but not be limited to, conditions of existing pavement, curbs, sidewalks, driveways, culverts, ditches, berms, fences, shrubs and landscaping, major structural conditions of commercial buildings, fences, signs, headwalls, general terrain, and similar items.

4. A representative of the Engineer, Owner, and Contractor shall accompany the photographer during recording sessions, to assist with location of the alignment and areas of construction activity, and identification of items and conditions to be recorded. A log sheet showing the recording sequences shall be maintained; it shall list the start and stop time/date for each sequence, plus a brief description of the areas documented. The end of each recording tape shall include a visual record of the original log sheet to preserve this information in the event of loss or damage.

5. All recordings shall be completed during periods of adequate lighting and visibility. Sufficient lighting must be available to provide proper illumination of shadowed areas, and proper exposure adjustments shall be made where required. No taping shall be completed during precipitation, mist, fog, or when

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more than 10% of the ground surface has snow cover.

F. Ownership and Authenticity of Originals:
   1. All original audio/video recordings shall become the property of Owner, plus one duplicate of each shall be provided to Engineer. Each shall be provided in a protective sleeve or case, identified as to Contract name and number, production date of original recording, name of Contractor, and photographer's name or trademark; a legible copy of the log shall be included.
   2. The photographer shall also furnish a notarized affidavit, attesting to the production of the original audio/video, and their authenticity.

3.4 ADDITIONAL PHOTOGRAPHS:

A. From time to time Engineer may issue requests for photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order, and are not included in the Contract Price or an Allowance.
   1. Engineer will give the photographer 3 days' notice, where feasible.
   2. In emergency situations, the photographer shall take additional photographs within 24 hours of Engineer's request.
   3. Circumstances that could require additional photographs include, but are not limited to:
      a. Substantial Completion of a major phase or component of Work.
      b. Owner's request for special publicity photographs.
      c. Special events planned at Project Site.
      d. Immediate follow-up when on-site events result in construction damage or losses.
      e. Photographs to be taken at fabrication locations away from Project Site.
      f. Extra record photographs at time of final acceptance.

END OF SECTION

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SECTION 01330 - SUBMITTALS

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes definitions, descriptions, transmittal, and review of submittals.

B. Related Work Specified Elsewhere:
   1. Project Meetings, Schedules and Reports: SECTION 01320.
   2. Construction Photographs: SECTION 01325.
   3. Project Identification and Signs: SECTION 01580.
   4. Contract Closeout: SECTION 01780.

1.2 GENERAL INFORMATION:

A. Definitions:
   1. Shop Drawings, product data, and samples are technical submittals prepared by Contractor, Subcontractor, manufacturer, or Supplier and submitted by Contractor to Engineer as a basis for approval of the use of Equipment and Materials proposed for incorporation in the Work or needed to describe installation, operation, maintenance, or technical properties.
      a. Shop Drawings include custom prepared data of all types including drawings, diagrams, performance curves, material schedules, templates, instructions, and similar information not in standard printed form applicable to other projects.
      b. Product data includes standard printed information on materials, products and systems; not custom prepared for this Project, other than the designation of selections from available choices.
      c. Samples include both fabricated and unfabricated physical examples of materials, products, and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or for more detailed testing and analysis. Mock-ups are a special form of Samples which are too large to be handled in the specified manner for transmittal of Sample Submittals.
   2. Informational Submittals are those technical reports, administrative Submittals, certificates and guarantees not defined as Shop Drawings, product data, or Samples.
      a. Technical reports include laboratory reports, tests, technical procedures, technical records, and Contractor's design analysis.
      b. Administrative Submittals are those nontechnical Submittals required by the Contract Documents or deemed necessary for administrative records. These Submittals include maintenance agreements, Bonds, Project photographs, physical work records, statements of

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applicability, copies of industry standards, Project record data, security/protection/safety data, and similar type Submittals.

c. Certificates and guarantees are those Submittals on Equipment and Materials where a written certificate or guarantee from the manufacturer or Supplier is called for in the Specifications.

B. Quality Requirements:

1. Submittals such as Shop Drawings and product data shall be of the quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. Drawings such as reproducibles shall be usable for further reproduction to yield legible hard copy.

2. Documents submitted to Engineer that do not conform to these requirements shall be subject to rejection by Engineer, and upon request by Engineer, Contractor shall resubmit conforming documents. If conforming Submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as may be necessary to meet such requirements. Contractor's (or his Subcontractor's) failure to initially satisfy the legibility quality requirements will not relieve Contractor (or his Subcontractors) from meeting the required schedule for Submittal of Shop Drawings and product data.

C. Language and Dimensions:

1. All words and dimensional units shall be in the English language.

D. Submittal Completeness:

1. Submittals shall be complete with respect to dimensions, design criteria, materials of construction, and other information specified to enable Engineer to review the information effectively.

2. Where standard drawings are furnished which cover a number of variations of the general class of Equipment, each such drawing shall be individually annotated to describe exactly which parts of the drawing apply to the Equipment being furnished. Use hatch marks to indicate variations that do not apply to the Submittal. The use of "highlighting markers" is not an acceptable means of annotating Submittals. Such annotation shall also include proper identification of the Submittal permanently attached to the drawing.

3. Reproductions or copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings. Contractor may use a reproduction of Engineer prepared Contract Drawings for erection drawings such as to indicate information on erection or to identify detail drawing references. Where the drawings are revised to show this additional Contractor information, Engineer's title block shall be replaced with a Contractor's title block, and Engineer's professional seal shall be removed from the drawing. The Contractor shall revise these erection drawings for subsequent Engineer revisions to the Contract Drawings.

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1.3 TECHNICAL SUBMITTALS:

A. Items shall include, but not be limited to, the following:
   1. Manufacturer's specifications.
   2. Catalogs, or parts thereof, of manufactured Equipment.
   3. Shop fabrication and erection drawings.
   4. General outline drawings of Equipment showing overall dimensions, location of major components, weights, and location of required connections.
   5. Detailed Equipment installation drawings, showing foundation details, anchor bolt sizes and locations, baseplate sizes, location of Owner's connections; and all clearances required for erection, operation, and disassembly for maintenance.
   6. Bills of material and spare parts list.
   7. Instruction books and operating manuals.
   8. Material lists or schedules.
   9. Performance tests on Equipment by manufacturers.
   10. Concrete mix design information.
   11. Samples.
   12. All drawings, catalogs or parts thereof, manufacturer's specifications and data, samples, instructions, and other information specified or necessary:
      a. For Engineer to determine that the Equipment and Materials conform with the design concept and comply with the intent of the Contract Documents.
      b. For the proper erection, installation, operation and maintenance of the Equipment and Materials which Engineer will review for general content but not for substance.
      c. For Engineer to determine what supports, anchorages, structural details, connections, and services are required for the Equipment and Materials, and the effects on contiguous or related structures and Equipment and Materials.

B. Schedule of Submittals:
   1. Prepare for Engineer's concurrence, a schedule for submission of all Submittals specified or necessary for Engineer's approval of the use of Equipment and Materials proposed for incorporation in the Work or needed for proper installation, operation, or maintenance. Submit the schedule with the procurement schedule and construction progress schedule. Schedule submission of all Submittals to permit review, fabrication, and delivery in time so as to not cause a delay in the Work of Contractor or his Subcontractors or any other contractors as described herein.
   2. In establishing schedule for Submittals, allow 20 days in Engineer's office for

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reviewing original Submittals and 20 days in Engineer's office for reviewing resubmittals.

3. The schedule shall indicate the anticipated dates of original submission for each item and Engineer's approval thereof, and shall be based upon at least one resubmission of each item.

4. Schedule all Submittals required prior to fabrication or manufacture for submission within 7 days of the Notice to Proceed Commence Times date. Schedule Submittals pertaining to storage, installation and operation at the Site for Engineer's approval prior to delivery of the Equipment and Materials.

5. Resubmit Submittals the number of times required for Engineer's "Submittal Approved." However, any need for resubmittals in excess of the number set forth in the accepted schedule, or any other delay in obtaining approval of Submittals, will not be grounds for extension of the Contract Times, provided Engineer completes his reviews within the times stated above.

C. Transmittal of Submittals:

1. All Submittals for Equipment and Materials furnished by Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Contractor.

2. After checking and verifying all field measurements, transmit all Submittals to Engineer for approval as follows:

   a. Identify each Submittal by Project name and number, Contract title and number, and the Specification Section and Article number marked thereon or in the letter of transmittal. Unidentifiable Submittals will be returned for proper identification.
   b. Check and stamp Submittals of Subcontractors, Suppliers, and manufacturers with Contractor's approval prior to transmitting them to Engineer. Contractor's stamp of approval shall constitute a representation to Owner and Engineer that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or Contractor assumes full responsibility for doing so, and that Contractor has coordinated each Submittal with the requirements of the Work and the Contract Documents.
   c. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from the requirements of the Contract Documents.
   d. Make all modifications noted or indicated by Engineer and return revised prints, copies, or Samples until approved. Direct specific attention in writing, or on revised Submittals, to changes other than the modifications called for by Engineer on previous Submittals. After Submittals have been approved, submit copies thereof for final distribution. Prints of approved drawings transmitted for final distribution will not be further reviewed and are not to be revised. If

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errors are discovered during manufacture or fabrication, correct the Submittal and resubmit for review.

e. Following completion of the Work and prior to final payment, furnish record documents and approved Samples and Shop Drawings necessary to indicate "as constructed" conditions, including field modifications, in the number of copies specified. Furnish additional copies for insertion in Equipment instruction books and operating manuals as required. All such copies shall be clearly marked "PROJECT RECORD."

f. Work requiring a Submittal shall not be commenced or shipped until the Submittal has been stamped "Submittal Approved" or "Submittal Approved as Noted" by Engineer.

g. Keep a copy or sample of each Submittal in good order at the site.

3. Quantity Requirements:

a. Except as otherwise specified, transmit all manufacturers' or fabricators' Shop Drawings in the quantity as follows:
   1) Initial Submittal: 5 copies to Engineer. One copy will be returned to Contractor.
   2) Resubmittals: 5 copies to Engineer. One copy will be returned to Contractor.
   3) Submittal for Final Distribution: 4 copies plus the number of copies required by Contractor to Engineer.
   4) As-Constructed Prints: 2 copies to Engineer.

b. Transmit Submittals of product data as follows:
   1) Initial Submittal: 5 copies to Engineer. One copy will be returned to Contractor.
   2) Resubmittals: 5 copies to Engineer. One copy will be returned to Contractor.
   3) Submittal for Final Distribution: 4 copies plus the number of copies required by Contractor, to Engineer.

c. Transmit Submittals of material Samples and similar items as follows:
   1) Initial Submittal: 3 to Engineer.
   2) Resubmittal: 3 to Engineer.
   3) Upon approval, 1 Sample will be returned to Contractor.

d. Transmit Submittals of Equipment instruction books and operating manuals as follows:
   1) Initial Submittal: 3 copies to Engineer. One copy will be returned to Contractor.
   2) Resubmittals: 3 copies to Engineer. One copy will be returned to Contractor.
   3) Submittal for Final Distribution: 3 copies to Engineer.

e. Transmit "Submittals for Reference Only": 4 copies to Engineer.

f. Owner may copy and use for internal operations and staff training purposes any and all document Submittals required by this Contract and approved for final distribution, whether or not such documents are copyrighted, at no additional cost to Owner. If permission to copy any

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such Submittal for the purposes stated is unreasonably withheld from Owner by Contractor or any Subcontractor, manufacturer, or Supplier, Contractor shall provide 20 copies plus the number of copies required by Contractor to Engineer for final distribution.

4. Copies of the Equipment erection drawings and other Submittals required for the installation of Equipment furnished by others under separate contract for installation under this Contract will be transmitted to Contractor by Engineer in the final distribution of such Submittals.

5. Information to Manufacturer's District Office: Manufacturers and Suppliers of Equipment and Materials shall furnish copies of all agreements, drawings, specifications, operating instructions, correspondence, and other matters associated with this Contract to the manufacturer's district office servicing the Owner. Insofar as practicable, all business matters relative to Equipment and Materials included in this Contract shall be conducted through such local district offices.

D. Engineer's Review:

1. Engineer will review and return Submittals to Contractor with appropriate notations. Instruction books and similar Submittals will be reviewed by Engineer for general content but not for detailed substance.

2. Engineer's approval of Submittals will not relieve Contractor from Contractor's responsibility as stated in the General Conditions.

3. Engineer shall review each submittal a maximum of 2 times at no cost to the Contractor, not including record copies of submittals. Contractor shall be responsible for the cost of Engineer's review of any submittal after the second review of a particular submittal. The cost of any such reviews will be billed to the Contractor at a rate of $140.00 per hour and at a minimum of 1 hour each review after the second submittal. Any outstanding amount due to Engineer shall be withheld from the final payment to the Contractor.

E. Submittal Action Stamp:

1. Engineer's review action stamp, appropriately completed, will appear on all Submittals of Contractor when returned by Engineer. Review status designations listed on Engineer's action stamp are defined as follows:

SUBMITTAL APPROVED: Signifies Equipment or Material represented by the Submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work. Contractor is to proceed with fabrication or procurement of the items and with related Work. Copies of the Submittal are to be transmitted to Engineer for final distribution.

SUBMITTAL APPROVED AS NOTED (RESUBMIT): Signifies Equipment and Material represented by the Submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for

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incorporation in the Work in accordance with Engineer's notations. Contractor is to proceed with fabrication or procurement of the items and with related Work in accordance with Engineer's notations and is to submit a revised Submittal responsive to notations marked on the returned Submittal or written in the letter of transmittal.

SUBMITTAL RETURNED FOR REVISION (RESUBMIT): Signifies Equipment and Material represented by the Submittal appears to conform with the design concept and comply with the intent of the Contract Documents but information is either insufficient in detail or contains discrepancies which prevent Engineer from completing his review. Contractor is to resubmit revised information responsive to Engineer's annotations on the returned Submittal or written in the letter of transmittal. Fabrication or procurement of items represented by the Submittal and related Work is not to proceed until the Submittal is approved.

SUBMITTAL NOT APPROVED (SUBMIT ANEW): Signifies Equipment and Material represented by the Submittal does not conform with the design concept or comply with the intent of the Contract Documents and is disapproved for use in the Work. Contractor is to provide Submittals responsive to the Contract Documents.

FOR REFERENCE, NO APPROVAL REQUIRED: Signifies Submittals which are for supplementary information only; pamphlets, general information sheets, catalog cuts, standard sheets, bulletins and similar data, all of which are useful to Engineer or Owner in design, operation, or maintenance, but which by their nature do not constitute a basis for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Documents. Engineer reviews such Submittals for general content but not for substance.

F. Instruction Books and Operating Manuals:

1. Equipment instruction books and operating manuals shall be prepared by the manufacturer and shall include the following:

   a. Index and tabs.
   b. Instructions for installation, start-up, operation, inspection, maintenance, parts lists and recommended spare parts, and data sheets showing model numbers.
   c. Applicable drawings.
   d. Warranties and guarantees.
   e. Address of nearest manufacturer-authorized service facility.
   f. All additional data specified.

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1.4 INFORMATIONAL SUBMITTALS:

A. Informational Submittals are comprised of technical reports, administrative Submittals, and guarantees which relate to the Work, but do not require Engineer approval prior to proceeding with the Work. Informational Submittals include:

1. Hydrostatic testing of pipes.
2. Field test reports.
3. Concrete cylinder test reports.
4. Certification on Materials:
    a. Cement tests.
5. Soil test reports.
6. Temperature records.
7. Piping stress analysis.
8. Shipping or packing lists.
9. Job progress schedules.
10. Equipment and Material delivery schedules.
11. Progress photographs.
12. Warranties and guarantees.

B. Transmittal of Informational Submittals:

1. All informational Submittals furnished by Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Contractor unless otherwise specified.
    a. Identify each informational Submittal by Project name and number, Contract title and number, and the Specification Section and Article number marked thereon or in the letter of transmittal. Unidentifiable Submittals will be returned for proper identification.
    b. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from the requirements of the Contract Documents.
2. Quantity Requirements:
    a. Technical reports and administrative Submittals except as otherwise specified:
        1) Engineer: Two copies.
    b. Written Certificates and Guarantees:
        1) Engineer: Two copies.
3. Test Reports:
    a. Responsibilities of Contractor, Owner, and Engineer regarding tests and inspections of Equipment and Materials and completed Work are set forth elsewhere in these Contract Documents.

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b. The party specified responsible for testing or inspection shall in each case, unless otherwise specified, arrange for the testing laboratory or reporting agency to distribute test reports as follows:
   1) Owner: Two copies.
   2) Engineer: One copy.
   3) Resident Project Representative: One copy.
   4) Contractor: Two copies.
   5) Manufacturer or Supplier: One copy.

C. Engineer's Review:
   1. Engineer will review informational Submittals for indications of Work or Material deficiencies.
   2. Engineer will respond to Contractor on those informational Submittals which indicate Work or Material deficiency.

PART 2 PRODUCTS - NOT APPLICABLE.

PART 3 EXECUTION NOT APPLICABLE.

END OF SECTION 01330

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SECTION 01420 - DEFINITIONS AND STANDARDS

PART 1 GENERAL

1.1 SUMMARY:

A. Definitions.
   1. Basic contract definitions used in the Contract Documents are defined in the GENERAL CONDITIONS. Definitions and explanations are not necessarily either complete or exclusive, but are general for the Work.
   2. General Requirements are the provisions or requirements of DIVISION 1 Sections, and which apply to the entire Work of the Contract.

B. Related Information Specified Elsewhere: Specification standards and associations applicable to the Work are specified in each Section.

1.2 SPECIFICATION FORMAT AND CONTENT EXPLANATIONS:

A. Specification format: The Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's (CSI) 16 – Division format and Master Format numbering system. Some portions may not fully comply and no particular significance will be attached to such compliance or noncompliance.
   1. Divisions and Sections: For convenience, a basic unit of Specification text is a "Section," each unit of which is numbered and named. These are organized with related Sections, organization and sequencing of Specifications. The Section title is not intended to limit meaning or content of Section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of text.
   2. Section Numbering: Used for identification and to facilitate cross-references in Contract Documents. Sections are placed in numeric sequence; however, numbering sequence is not complete, and listing of Sections in Table of Contents at beginning of the Project Manual must be consulted to determine numbers and names of Specification Sections in the Contract Documents.
   3. Page Numbering: Numbered independently for each Section. Section number is shown with page number at bottom of each page, to facilitate location of text.
   4. Parts: Each Section of Specifications generally has been subdivided into three basic "parts" for uniformity and convenience (PART I – GENERAL, PART 2 – PRODUCTS, PART 3 – EXECUTION). These "Parts" do not limit the meaning of text within. Some Sections may not contain all three "Parts" when not applicable, or may contain more than three "Parts" to add clarity to organization of Section.
   5. Underscoring of Titles: Used strictly to assist reader of Specification in scanning text for key words in content. No emphasis on or relative importance is intended except where underscoring may be used in body of text to emphasize a duty, critical requirement, or similar situation.

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6. Project Identification: Project identification is recorded at the bottom of each page of Specifications to minimize possible misuse of Specifications, or confusion with other Project Specifications.

B. Specification Content:
   1. These Specifications apply certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
      a. Imperative and Streamlined Language: These Specifications are written in imperative and abbreviated form. This imperative language of the technical Sections is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall," "The Contractor shall," and "shall be," and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements where stated imperatively or otherwise.
      b. Specifying methods: The techniques or methods of specifying requirements varies throughout the text, and may include "prescriptive," "compliance with standards," "performance," "proprietary," or a combination of these. The method used for specifying one unit of Work has no bearing on requirements for another unit of Work.
      c. Overlapping and Conflicting Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping those different standards or requirements establishes different or conflicting minimums or levels of quality, notify Engineer for a decision.
      d. Abbreviations: Throughout the Contract Documents are abbreviations implying words and meanings which shall be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and in conjunction with coordination of Specification requirements with notations on Drawings and in schedules. These are normally defined at first instance of use. Organizational and association names and titles of general standards are also abbreviated.

C. Assignment of Specialists: In certain instances, Specification text requires that specific Work be assigned to specialists in the operations to be performed. These specialists shall be engaged for performance of those units of Work, and assignments are requirements over which Contractor has no choice or option. These assignments shall not be confused with, and are not intended to interfere with, enforcement of building codes and similar regulations governing Work, local and union jurisdictions, and similar conventions. Nevertheless, final responsibility for fulfillment of Contract requirements remains with Contractor.

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D. Trades: Except as otherwise specified or indicated, the use of Titles (such as "carpentry" in Specification text) implies neither that the Work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradesperson of that corresponding generic name.

1.3 DRAWINGS:

A. Except as otherwise indicated, graphic symbols used on Drawings are those symbols recognized in the construction industry for purposes indicated. Refer instances of uncertainty to Engineer for clarification.

1.4 INDUSTRY STANDARDS:

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made part of the Contract Documents by reference and are stated in each Section.
   1. Referenced standards, referenced directly in Contract Documents or by governing regulations, have precedence over non-referenced standards which are recognized in industry for applicability to the Work.
   2. Where compliance with an industry standard is required, standard in effect shall be as stated in the Agreement.
   3. Where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected, the Engineer will decide whether to issue a Change Order to proceed with the updated standard.
   4. In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances
   5. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
      a. Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from publication source.

B. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other contract Documents, they mean the recognized name of the

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trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION - NOT APPLICABLE

END OF SECTION 01420

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SECTION 01520 - FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes requirements for temporary structures required for office and storage space required by Contractor and Engineer.

B. Related Work Specified Elsewhere:
   1. Equipment and Materials: SECTION 01600.
   2. Temporary Utilities and Facilities: SECTION 01560.

PART 2 PRODUCTS

2.1 FIELD OFFICES: NOT USED.

A. General:
   1. Provide trailers, mobile buildings, or buildings constructed with floors raised aboveground, with steps, landings, and railings at entrance doors.
   2. Buildings shall be structurally sound, secure, and weathertight.
   3. Provide appropriate type fire extinguishers at each office and storage area.
   4. Maintain offices during progress of the Work until final completion.
   5. Install office spaces ready for occupancy 15 days after date stated in Notice to Proceed.

B. Contractor's Office:
   1. Provide a field office for Contractor's superintendent on the Site.
   2. It shall be of size required for general use, with lights, heat, furnishings, telephone service, and other necessary facilities and utilities required by Contractor's operations.

C. Resident Project Representative's Office:
   1. Provide a field office for Engineer's Resident Project Representative on the Site.
   2. Provide the following minimum requirements:
      a. The office shall be of suitable height and of ample size to accommodate the furniture and equipment listed below, without crowding (at least 400 sq. ft. of floor area). The office shall be subdivided and contain one private office of approximately 150 sq. ft. for use by Resident Project Representative and the remainder of the trailer shall be a general purpose/conference room. The office shall be weathertight; the walls and roof shall be insulated with at least 1/12-inch insulating board and suitably ventilated; and the floor shall be

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tight and of double-thick construction. The office shall have at least three screened windows which can be both opened and locked shut, and the door shall have a cylinder lock with two keys. There also shall be a screen door and storm windows or double glazed windows. If trailer is furnished, provide weather skirt around trailer base. Storm doors are required at all entrances.

b. Contractor shall also provide acceptable toilet facilities for the use of Engineer's Resident Project Representative.

c. The Contractor shall furnish the following furniture, equipment, supplies, and services:

1) One plan table or sloping plan shelf, about 3 feet by 5 feet, with a reasonably smooth top, and one suitable swivel stool.
2) Two conference tables, each approximately 30 inches by 72 inches and 10 additional folding chairs.
3) Shelves, counters, and tackboard as directed.
4) Electric lights and outlets as directed. Contractor shall pay all charges for the energy used.
5) Broom and dustpan.
6) Two desks for general office use, each about 3 feet by 5 feet, with two swivel type office chairs.
7) Two four-drawer, legal size metal filing cabinets, each with lock and two keys.
8) Private line telephone with one telephone (with speaker phone). The Contractor shall pay all charges for local calls.
9) Two portable ABC type fire extinguishers of at least 4-lb capacity.
10) Supply of drinking water with a suitable electric water cooler.
11) Thermostatically controlled heating units or system of adequate capacity to maintain a minimum temperature of not less than 70°F under all cold weather conditions. Contractor shall provide all fuel or power used and service necessary.
12) Thermostatically controlled, refrigerant type, air conditioners of adequate capacity to maintain a maximum temperature of not more than 72°F under a hot weather conditions. Contractor shall provide all service necessary and provide all power used.

D. Services:

1. Lighting: 50 foot-candles at desktop height. Exterior lighting at entrance door.
2. Heating and air conditioning.
3. Electrical Service: Minimum of two circuits, 110V, 60-hertz. Minimum of four 110V duplex convenience outlets.
4. Toilet facilities.

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2.2 STORAGE SHEDS AND TRAILERS:

A. On Site:
   1. Provide temporary buildings or trailers needed for storage of Equipment and Materials installed under this Contract.
   2. Provide ventilation and heating as required by Equipment and Material stored.

B. Off Site:
   1. Advise Engineer of any arrangements made for storage of Equipment and Materials in a place other than Owner's Site. Furnish evidence of insurance coverage with Application for Payment in conformance with the GENERAL CONDITIONS.

PART 3 EXECUTION

3.1 LOCATION, INSTALLATION AND MAINTENANCE:

A. General:
   1. Place temporary buildings, trailers and stored materials in locations acceptable to Owner or Engineer.
   2. Install field offices and sheds to resist winds and elements of the locality where installed.
   3. Remove when no longer needed at the Site or when Work is completed.
   4. Keep approach walks free of leaves, mud, water, ice, or snow.
   5. At completion of Work, remove temporary buildings and trailers, foundations (if any), utility services, and debris.
   6. Prepare ground or paved areas as specified in applicable Sections.

END OF SECTION

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SECTION 01530 - TEMPORARY BARRIERS AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes General Requirements for:
   1. Safety and protection of Work.
   2. Safety and protection of existing property.
   3. Barriers.
   4. Security.
   5. Environmental controls.
   6. Access roads and parking areas.
   7. Traffic control and use of roadways.

B. Related Work Specified Elsewhere:
   1. Temporary Utilities and Facilities: SECTION 01560.
   2. Contract Closeout: SECTION 01780.

PART 2 PRODUCTS - NOT APPLICABLE.

PART 3 EXECUTION

3.1 SAFETY AND PROTECTION OF WORK AND PROPERTY:

A. General:
   1. Provide for the safety and protection of the Work as set forth in GENERAL CONDITIONS.
   2. Provide protection at all times against rain, wind, storms, frost, freezing, condensation, or heat so as to maintain all Work and Equipment and Materials free from injury or damage. At the end of each day, all new Work likely to be damaged shall be appropriately protected.
   3. Notify Engineer immediately at any time operations are stopped due to conditions which make it impossible to continue operations safely or to obtain proper results.
   4. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations, floors, pits, trenches, manholes, and ducts free of water.
   5. Concrete less than 28 days old shall not be loaded without written permission from Engineer.

B. Property Other than Owners:
   1. Provide for the safety and protection of property as set forth in the GENERAL

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CONDITIONS. Report immediately to the owners thereof and promptly repair damage to existing facilities resulting from construction operations.

2. Names and telephone numbers of representatives of agencies and utilities having jurisdiction over streets and utilities in the Work area can be obtained from Owner for the utilities listed below. Concerned agencies or utilities shall be contacted a minimum of 24 hours prior to performing Work, closing streets and other traffic areas, or excavating near underground utilities or pole lines.

    a. Water.
    b. Gas.
    c. Sanitary sewers.
    d. Pipeline companies.
    e. Telephone.
    f. Electric.
    g. Municipal streets.
    h. State highways.
    i. Fire.
    j. Police.

3. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

4. Where fences are to be breached on private property, the owners thereof shall be contacted and arrangements made to ensure proper protection of any pets, livestock or other property thus exposed.

5. The applicable requirements specified for protection of the Work shall also apply to the protection of existing property of others.

6. Before acceptance of the Work by Owner, restore all property affected by Contractor's operations to the original or better condition.

3.2 BARRIERS:

A. General:

1. Furnish, install, and maintain suitable barriers as required to prevent public entry, protect the public, and to protect the Work, existing facilities, trees, and plants from construction operations. Remove when no longer needed or at completion of Work.

2. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards or regulatory agencies.

3. Barriers shall be of a neat and reasonable uniform appearance, structurally adequate for the required purposes.

4. Maintain barriers in good repair and clean condition for adequate visibility.

5. Relocate barriers as required by progress of Work.

6. Repair damage caused by installation and restore area to original or better condition. Clean the area.

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3.3 SECURITY:

A. Provide security as required to look after the interest of Contractors and keeping unauthorized personnel away from the construction area, Equipment and Material storage areas, and possible threats to the Work and other property by rain, wind, fire, malicious damage, and other hazards. Situations requiring attention shall be reported to the proper persons immediately or as soon as possible.

3.4 ENVIRONMENTAL CONTROLS:

A. Noise Control:
   1. Comply with all OSHA and County restrictions and regulations.

B. Dust Control:
   1. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and to prevent airborne dust from dispersing into the atmosphere.
   2. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

C. Water and Erosion Control:
   1. Provide methods to control surface water to prevent damage to the Project, the Site, or adjoining properties.
   2. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
      a. Hold the areas of bare soil exposed at one time to a minimum.
      b. Provide temporary control measures such as berms, dikes, and drains.
   3. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
   4. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater.
   5. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the Site or to adjoining areas.
   6. Contractor to provide all permits as required.

D. Rodent Control:
   1. Provide rodent control as necessary to prevent infestation of construction or storage areas.
      a. Employ methods and use materials which will not adversely affect conditions at the Site or adjoining properties.

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b. Should the use of rodenticides be considered necessary, submit an informational copy of the proposed program to Owner with a copy to Engineer. Clearly indicate:
   1) The area or areas to be treated;
   2) The rodenticides to be used, with a copy of the manufacturer's printed instructions; and
   3) The pollution preventive measures to be employed.

2. The use of any rodenticide shall be in accordance with the manufacturer's printed instructions and regulatory agencies.

E. Debris Control and Clean-Up:
1. Keep the premises free at all times from accumulations of debris, waste materials, and rubbish caused by construction operations and employees. Responsibilities shall include:
   a. Adequate trash receptacles about the Site, emptied promptly when filled;
   b. Periodic cleanup to avoid hazards or interference with operations at the Site and to maintain the Site in a reasonably neat condition;
   c. The keeping of construction materials such as forms and scaffolding neatly stacked; and
   d. Immediate cleanup to protect the Work by removing splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from walls, floors, and metal surfaces before surfaces are marred.
2. Prohibit overloading of trucks to prevent spillages on access and haul routes. Provide periodic inspection of traffic areas to enforce requirements.
3. Final cleanup is specified in SECTION 01780: CONTRACT CLOSEOUT.

F. Pollution Control:
1. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of hazardous or toxic substances from construction operations.
2. Provide equipment and personnel, perform emergency measures required to contain any spillages, and remove contaminated soils or liquids. Excavate and dispose of any contaminated earth off-site in approved locations, and replace with suitable compacted fill and topsoil.
3. Take special measures to prevent harmful substances from entering public waters, sanitary, or storm sewers.

3.5 ACCESS ROADS AND PARKING AREAS:

A. New Temporary On-Site Roads and Parking Areas:
1. Locate roads, drives, walks, and parking facilities to provide access to construction offices, mobilization, Work, storage areas, and other areas required for execution of the Contract.

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a. Consult with Owner and Engineer regarding any desired deviation therefrom.
b. Size of parking facilities shall be adequate to provide for needs of Contractor's personnel, Resident Project Representatives, and visits to Site by Engineer and Owner.

2. Provide access for emergency vehicles. Maintain driveways a minimum of 15 feet wide between and around combustible materials in storage and mobilization areas.

3. Maintain traffic areas free of excavated materials, construction equipment, snow, ice, and debris.

4. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

5. Keep fire hydrants and water control valves free from obstruction and accessible for use.

6. Construction:

a. Clear areas required.
b. Fill, compact, and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings. Materials and construction shall be as specified in DIVISION 2.
c. Provide for surface drainage of facilities and surrounding areas.
d. Maintain roads, walks, and parking areas in a sound, clean condition. Repair or replace portions damaged during progress of Work.

7. Removal:

a. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation, unless construction is to be integrated into permanent construction. Remove and dispose of compacted materials to depths required by various conditions to be met in completed Work.
b. Restore areas to original, better, or specified condition at completion of Work.

B. Existing On-Site Roads and Parking Areas:
1. Contractor shall access the Project Site via the existing improved access road. Any issues pertaining to the road integrity will be coordinated with the Owner.

3.6 TRAFFIC CONTROL AND USE OF ROADWAYS:

A. Traffic Control:
1. Provide, operate, and maintain equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, on-site access roads, and parking areas. This includes traffic signals and signs, flagmen, flares, lights, barricades and other devices or personnel as necessary to adequately protect the public.

2. Remove temporary equipment and facilities when no longer required. Restore

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grounds to original, better or specified condition when no longer required.

3. Provide and maintain suitable detours or other temporary expedients if necessary.

4. Bridge over open trenches where necessary to maintain traffic.

5. Consult with governing authorities to establish public thoroughfares which will be used as haul routes and Site access. All operations shall meet the approval of owners or agencies having jurisdiction.

B. Maintenance of Roadways:

1. Repair roads, walkways, and other traffic areas damaged by operations. Keep traffic areas as free as possible of excavated materials and maintain in a manner to eliminate dust, mud and hazardous conditions.

2. All operations and repairs shall meet the approval of owners or agencies having jurisdiction.

END OF SECTION

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SECTION 01560 - TEMPORARY UTILITIES AND FACILITIES

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes requirements of a temporary nature not normally incorporated into final Work. It includes the following:
   1. Utility services.
   2. Construction and support facilities.
   3. Construction aids.
   4. Safety and health.
   5. Fire protection.

B. Related Work Specified Elsewhere:
   1. Temporary Barriers and Controls: SECTION 01530.
   2. Field Offices and Sheds: SECTION 01520.

1.2 REFERENCES:

A. American National Standards Association (ANSI):
   1. A10 Series - Safety Requirements for Construction and Demolition.

B. National Electrical Contractors Association (NECA):
   1. Electrical Design Library - Temporary Electrical Facilities.

C. National Fire Protection Association (NFPA):
   1. 10 - Portable Fire Extinguishers.
   2. 70 - National Electrical Code.
   3. 241 - Safeguarding Construction, Alterations, and Demolition Operations.

D. Underwriters Laboratory (UL).

1.3 SUBMITTALS:

A. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work.

1.4 QUALITY ASSURANCE:

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   1. Building Code requirements.

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2. Health and safety regulations.

3. Utility company regulations.

4. Police, Fire Department, and rescue squad rules.

5. Environmental protection regulations.

B. Standards:

1. Comply with NFPA 10 and 241, and ANSI A10 Series standards "Temporary Electrical Facilities."

2. Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS:

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to owner, change over from temporary service to permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the Site.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

A. Provide new materials and equipment. If acceptable to Engineer, undamaged previously used materials and equipment in serviceable condition may be used. Provide materials and equipment suitable for the use intended, of capacity for required usage, and meeting applicable codes and standards. Comply with requirements of DIVISIONS 2 through 16.

B. Water: Provide potable water approved by local health authorities.

C. Water Hoses: Provide ¾", heavy-duty, abrasion-resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

D. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

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E. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

F. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

G. Heating Units: Provide temporary heating units that have been tested and labeled by UL or another recognized trade association related to the type of fuel being consumed.

H. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 EXECUTION

3.1 TEMPORARY UTILITIES:

A. General:

1. Engage the appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

2. Provide adequate utility capacity at each stage of construction. Prior to availability of temporary utilities at the site, provide trucked-in services as required for start-up of construction operations.

3. Obtain and pay for temporary easements required to bring temporary utilities to the Project site, where the Owner's permanent easement cannot be utilized for that purpose.

4. Furnish, install, and maintain temporary utilities required for adequate construction, safety, and security. Modify, relocate, and extend systems as Work progresses. Repair damage caused by installation or use of temporary facilities. Grade the areas of Site affected by temporary installations to required elevations and grades, and clean the area. Remove on completion of Work or until service or facilities are no longer needed.

5. The types of temporary construction utilities and facilities required include, but not by way of limitation, water distribution, drainage, dewatering equipment, enclosure of Work, heat, ventilation, electrical power distribution, lighting, hoisting facilities, stairs, ladders, and roads.

6. Inspect and test each service before placing temporary utilities in use. Arrange

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for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

7. Materials used for temporary service shall not be used in the permanent system unless so specified or acceptable to Engineer.

3.2 TEMPORARY ELECTRICITY AND LIGHTING:

A. New Service:
   1. Arrange with utility company and provide service required for power and lighting.
   2. Connect temporary service in a manner directed by utility company officials. Provide separate meter for metering of power used by all entities authorized to be at or perform Work at the Project Site.
   3. The electric service shall be of sufficient capacity and characteristics for the various construction tools, machinery, lights, heating and air conditioning, pumps, and other tools required by Contractor and his Subcontractors.
   4. Provide weatherproof, grounded, power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, and lighting. Provide overload protection.
   5. Provide all necessary temporary wiring, panel boards, switches, outlets, and other devices so that power and lighting is available throughout the construction area.
   6. Provide adequate artificial lighting for all areas of Work when natural light is not adequate for Work.
      a. Sufficient light shall be provided for general construction areas and floor areas, with additional sufficient lighting for specific tasks and to meet safety requirements.
   7. Maintain permanent system as specified for temporary facilities.

B. Use of Existing System:
   1. Owner's existing system shall not be used for temporary electricity.

C. Use of Permanent System:
   1. Prior to use of permanent system for construction purposes, obtain written permission of Owner.
   2. Maintain permanent system as specified for temporary facilities.

D. Costs of Installation and Operation:
   1. Pay fees and charges for permits and applications.
   2. Pay costs of installation, maintenance, removal of temporary services, and restoration of any permanent facilities used.
   3. Pay costs of electrical power used.

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4. Obtain and pay costs for temporary easements required across properties other than that of Owner.

3.3 TEMPORARY HEAT AND VENTILATION: NOT USED.

3.4 TEMPORARY WATER:

A. Contractor shall obtain water from Owner's existing fire hydrants in accordance with applicable Owner rules, regulations, policies, and procedures. Contractor is responsible for the cost of labor, equipment, and material to convey the water from the existing fire hydrants to the site of the Work.

B. Contractor shall obtain backflow preventer, meter, and valve from Owner, and in all other ways comply with Owner requirements for obtaining construction water from Owner hydrant.

C. Contractor will not be allowed to employ pumps which have their suction connected to Owner's hydrants. Flow from the fire hydrant must discharge to atmosphere prior to booster pumping.

D. Owner reserves the right to limit flow rate from fire hydrants so as not to adversely affect pressure and flow to adjacent residents.

E. Contractor may obtain water from other sources at his discretion and expense.

F. Costs of Installation and Operation:
1. Pay all costs for installation, maintenance, and removal.
2. Cost of water used will be paid by Contractor.

3.5 TEMPORARY TELEPHONE SERVICE: NOT USED.

3.6 TEMPORARY NATURAL GAS: NOT USED.

3.7 TEMPORARY SANITARY FACILITIES:

A. Contractor-Furnished Facilities:
1. Furnish, install, and maintain temporary sanitary facilities for use through construction period. Remove on completion of Work.
2. Provide for all construction workers under this Contract and representatives at the Site.
3. Toilet facilities shall be of the chemical-aerated recirculation or combustion type, properly vented, and fully enclosed with a glass- fiber-reinforced polyester shell or similar nonabsorbent material.
4. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide appropriate covered waste containers for used material.

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B. Use of Existing Facilities:
   1. Existing restroom facilities shall not be used.

3.8 SEWERS AND DRAINAGE: NOT USED.

3.9 TEMPORARY CONSTRUCTION AIDS:

A. General:
   1. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work, including, but not limited to: scaffolds, staging, ladders, stairs, ramps, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.
   2. Materials may be new or used, must be suitable for the intended purpose, and meet the requirements of applicable codes, regulations, and standards.
   3. Maintain all existing facilities and equipment in a condition equivalent to or better than condition at beginning of usage.

3.10 TEMPORARY ENCLOSURES:

A. New Construction:
   1. Provide temporary enclosure as required as Work progresses, to provide acceptable working conditions, weather protection for interior materials, allow for effective temporary heating, and to prevent entry of unauthorized persons.
   2. Provide temporary exterior doors with hardware, including being lockable.
      a. Other enclosures shall be removable as necessary for Work and for handling of materials.

3.11 TEMPORARY SAFETY AND HEALTH:

A. General: Contractor shall be responsible for development of safety and health programs for personnel at Project Site as specified in the GENERAL CONDITIONS.

3.12 TEMPORARY FIRE PROTECTION:

A. General:
   1. Contractor shall be responsible for development of a fire prevention and
   2. The program shall comply with the applicable provisions for safety and protection as set forth in the GENERAL CONDITIONS and with applicable parts of the NFPA 10 and 241.
   3. Locate fire extinguishers where convenient and effective for their intended
   4. Store combustible materials in containers in fire-safe locations.
   5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

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6. Provide supervision of welding operations and similar sources of fire ignition.

7. Post warning and instructions at each extinguisher location, and instruct construction personnel on proper use of extinguishers and other available facilities at Project Site. Post local fire department telephone number on or near each telephone instrument at Project Site.

B. Permanent Fire Protection:
   1. Complete fire protection facilities at earliest reasonable date, and place into operation, and make ready for emergency use.

   2. Instruct personnel at Site on availability and proper use.

3.13 INSTALLATION AND REMOVAL:

A. Relocation: Relocate construction aids as required by progress of construction, storage limitations, or Work requirements and to accommodate requirements of Owner and other contractors at the Site.

B. Removal: Remove temporary materials, equipment, and services when construction needs can be met and allowed by use of permanent construction, or at completion of the Project.

C. Repair: Clean and repair damage caused by installation or by use of temporary facilities.
   1. Remove foundations and underground installations for construction aids.

   2. Grade the areas of the Site affected by temporary installations to required elevations and clean the area.

END OF SECTION

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SECTION 01580 - PROJECT IDENTIFICATION AND SIGNS

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes basic requirements for temporary Project identification and informational signs required during construction.

B. Related Work Specified Elsewhere:
   1. Submittals: SECTION 01330.

1.2 QUALITY ASSURANCE:

A. Design sign and structure to withstand wind and environmental conditions of locality. Provide with finish adequate to withstand weathering, fading, chipping, and peeling for duration of construction.

1.3 SUBMITTALS:

A. Submit as specified in SECTION 01330.

B. Includes, but not limited to, the following:
   1. Shop Drawings and product data as applicable.
   2. Show content, layout, lettering, colors, structure, and foundation.

PART 2 PRODUCTS

2.1 IDENTIFICATION SIGNS:

A. Project Identification:
   1. Construct to design, size, and material indicated.
   2. Construct structure and framing of wood or metal, structurally adequate to resist design requirements of locality.
   3. Construct sign surface of minimum 1” thickness exterior grade plywood with medium density overlay. Panels shall be of size to minimize joints. Overall size shall be 4' x 8'.
   4. Rough hardware shall be galvanized or aluminum.
   5. Information Content:
      a. Project title, logo, and name of Owner as shown on Contract Documents.
      b. Name, title, and logo of Engineer.
      c. Name of prime Contractor.
      d. Scheduled Contract completion date
      e. Name of Funding Agency

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f. Contact Information for Public to obtain additional information

B. Contractor Identification: If not part of Project identification sign, provide and install Contractor's standard sign.

C. Engineer Identification: Engineer will furnish, install, and maintain his own signs.

2.2 INFORMATIONAL SIGNS:

A. Construction:
1. This includes signs for traffic, construction workers, and general public in regards to directions, warnings, hazards, locations of areas, facilities, equipment, and others of a similar nature.
2. Provide signs of design, size, color, and lettering as required by regulatory agencies. Signs shall be painted metal, wood, plastic, or fiberglass and of materials suitable for the conditions in which they are placed, such as weathering and fading.
3. Construct structure and framing of wood or metal, such that they are structurally adequate to resist design requirements of area of Project.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Project and Contractor Identification Sign(s):
1. Install in appropriate location so as not to obstruct traffic, pedestrians, or construction operations and as directed by Owner.
2. Erect on framing or foundation, and rigidly brace.
3. Maintain sign in good repair, in a clean and neat condition.
4. Remove upon completion of Project.

B. Informational Signs:
1. Install at appropriate locations and in sufficient quantities to assure visibility. Relocate as required by progress of Work.
2. Maintain signs in good repair, in a neat, clean, readable condition.
3. Remove all signs, framing, supports, and foundations upon completion of Project.

END OF SECTION

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SECTION 01600 - EQUIPMENT AND MATERIALS

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes administrative and procedural requirements governing Contractor's selection of products for use in the Project.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. For the applicability of industry standards to products specified: DIVISIONS 2 through 16.
   2. For submittal of Contractor's construction progress schedule and the Submittal schedule: SECTIONS 01320 and 01330.
   3. For handling requests for substitutions made after award of the Contract: GENERAL CONDITIONS.

1.2 DEFINITIONS:

A. Definitions used in this Article are not intended to change the meaning of other terms used in these Contract Documents, such as "specialties," "systems," "structures," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
   1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "Material," "Equipment," "system," and terms of similar intent.
      a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature that is current as of the date of the Contract Documents.
   2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
   3. "Equipment" is a product with operational or non-operational parts, whether motorized, or manually operated, that may require service connections, such as wiring or piping.

1.3 SUBMITTALS:

A. Submittals of products are specified in SECTION 01330 and in applicable sections of DIVISIONS 2 through 16.

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1.4 QUALITY ASSURANCE:

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
   1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete Project requirements in a timely manner, consult with Engineer to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Along with required labels and operating data, manufacturer or producer's nameplates, imprints, or trademarks may be placed on surfaces exposed to view.
   1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

1.5 TRANSPORTATION AND SHIPMENT:

A. Shipment Preparation:
   1. Contractor shall require manufacturers and Suppliers to prepare products for shipment in a manner to facilitate unloading and handling, and to protect against damage, deterioration, or unnecessary exposure to the elements in transit and storage. Provisions for protection shall include the following:
      a. Crates or other suitable packaging materials.
      b. Covers and other means to prevent corrosion, moisture damage, mechanical injury, and accumulation of dirt.
      c. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel.

B. Marking: Each product item shall be tagged or marked as identified in the delivery schedule or on Submittals. Complete packing lists and bills of material shall be included with each shipment. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

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1. Schedule delivery to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Allow ample time to avoid delay of the Work.

2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the Site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected. Inspect shipment to assure:

    a. Product complies with requirements of Contract Documents and reviewed Submittals.
    b. Quantities are correct.
    c. Containers and packages are intact and labels are legible.
    d. Products are properly protected and undamaged.

5. Store products at the Site in a manner that will facilitate inspection and measurement of quantity or counting of units. Mark deliveries of component parts of Equipment to identify the Equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units.

6. Store heavy Materials away from the Project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, and with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

8. Protect exposed machined surfaces and unpainted iron and steel as necessary with suitable rust preventive compounds.

9. Protect bearings and similar items with grease packing or oil lubrication.

10. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation.

11. For storage of pipe and other products on easements and rights-of-way in residential and commercial areas, do not exceed the minimum required by scheduled laying operations, and conform to all requirements of public authorities. Store or place pipe along roads, set back from shoulder or curb, and at an angle tending to deflect vehicles if struck. Place or block pipe to preclude its accidental movement.

B. Handling:
    1. Provide equipment and personnel necessary, to unload and handle products, by

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methods to prevent damage or soiling to products, or packaging.

2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points.

3. Provide additional protection to surrounding surfaces as necessary to prevent damage.

C. Maintenance of Storage:
1. Inspect stored products on a scheduled basis.

2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained.

3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.

D. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from subsequent construction operations. Remove coverings when no longer needed or as specified.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION:

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise specified or indicated, new at the time of installation.
1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

2. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Continued Availability: Where, because of the nature of its application, Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard products for which the manufacturer has published assurances that the products and

4. Conform to applicable Specifications, codes, standards, and regulatory agencies.

5. Comply with size, make, type, and quality specified, or as specifically approved in writing by Engineer.

6. Manufactured and Fabricated Products:

a. Design, fabricate, and assemble in accordance with the best engineering and shop practices.

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b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
c. Equipment and Materials shall be suitable for service conditions intended.
d. Equipment capacities, sizes, and dimensions indicated or specified shall be adhered to unless variations are specifically approved in writing by Engineer.
e. Provide labels and nameplates where required by regulatory agencies or to state identification and essential operating data.

7. Do not use products for any purpose other than that for which designed or specified.

8. To the fullest extent possible, provide products of the same kind from a single source.

PART 3 EXECUTION

3.1 INSTALLATION OF PRODUCTS:

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place except as required for proper movement and performance, and accurately located and aligned with other Work.

1. Obtain and distribute copies of manufacturer's printed instructions and recommendations if not a part of Submittals, containers, or packaging to parties involved in the installation, including a copy to Engineer and Resident Project Representative.

2. Maintain one complete set of instructions at the Site during installation and until completion.

3. Handle, install, connect, clean, condition, and adjust products in accordance with such instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 01780 - CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Instruction book and operating manual submittal.
   4. Submittal of warranties.
   5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in DIVISIONS 2 through 16.

C. Related Work Specified Elsewhere:
   1. Prerequisites to Substantial Completion and Final Acceptance: GENERAL CONDITIONS.
   2. Submittals: SECTION 01330.

1.2 SUBSTANTIAL COMPLETION:

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete.
      a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price.
      b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete work, and reasons the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents.
   4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities.
   5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.

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6. Deliver tools, spare parts, extra stock, and similar items.

7. Make final changeover of locks and transmit key to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete start-up testing of systems and instruction of Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the Site, along with construction tools, and similar elements.

9. Complete final cleanup requirements, including touch-up painting.

10. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued.

1. Engineer will repeat inspection when requested and assured by Contractor that the Work is Substantially Complete.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.3 FINAL ACCEPTANCE:

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the Contract Price.

3. Submit a certified copy of Engineer's final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.

4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when Owner takes possession of and assumed responsibility corresponding elements of Work.

5. Submit consent of Surety to final payment.

6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Submit a final liquidated damages settlement statement.

8. Submit executed Notice of Final Acceptance.

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B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.

1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

2. If necessary, reinspection will be repeated.

1.4 RECORD DOCUMENT SUBMITTALS:

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Record information concurrently with construction progress.

2. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "PROJECT RECORD" in neat, large, printed letters.

3. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings.

4. Note related Change Order numbers where applicable.

5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

6. Include the following:

   a. Depths of various elements of foundation in relation to finish first floor datum.
   b. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   c. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of construction.
   d. Where Submittals are used for mark up, record a cross reference at corresponding location on Drawings.
   e. Field changes of dimension and detail.

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f. Changes made by Change Order or other Modifications.
g. Details not on original Contract Drawings.

C. Record Specifications: Maintain one complete copy of the Contract Documents including Addenda. Include with the Contract Documents one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.

2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.

3. Note related record drawing information and product data.

4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records.

5. Include the following:

a. Manufacturer, trade name, catalog number, and Supplier of each product and item of Equipment actually installed, particularly optional and substitute items.
b. Changes made by Addendum, Change Order, or other Modifications.
c. Related Submittals.

D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.

2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.

3. Upon completion of markup, submit a complete set of record product data to Engineer for Owner's records.

E. Record Samples Submitted: Immediately prior to Substantial Completion, Contractor shall meet with Engineer and Owner's personnel at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with Owner's instructions regarding packaging, identification, and delivery to Owner.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records.

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G. Instruction Books and Operating Manuals: Organize operation and maintenance data into suitable sets of manageable size as specified in SECTION 01330.

H. Warranties and Bonds: Specified in GENERAL CONDITIONS, and SECTION 01330.

1.5 SPARE PARTS:

A. Products Required:
   1. Provide to Owner the quantities of products, spare parts, maintenance tools, and maintenance materials specified in individual Sections, in addition to that required for completion of Work.
   2. Products shall be identical to those installed in the Work. Include quantities required from Supplier or manufacturer of original purchase to avoid variations in manufacture.

B. Storage, Maintenance:
   1. Coordinate with Owner. Deliver and unload spare products to Owner at Project Site and obtain receipt prior to final payment.
   2. For portions of Project accepted and occupied by Owner prior to Substantial Completion, deliver the applicable spare products to owner at time of acceptance. Obtain receipt.
   3. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

PART 2 PRODUCTS - NOT APPLICABLE

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES:

A. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
   1. Instruction books and operating manuals.
   2. Record documents.
   3. Spare parts and materials.
   4. Tools.
   5. Lubricants.
   6. Fuels.
   7. Identification systems.

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8. Control sequences.
9. Hazards, hazardous chemicals data sheets.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING:

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in SECTION 01530.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Clean concrete floors to a "broom clean" condition.
d. Wipe surfaces of mechanical and electrical Equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
e. Remove debris and surface dirt from limited-access spaces including vaults, manholes, and similar spaces.
f. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

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g. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

2. Remove temporary structures, tools, equipment, supplies, and surplus materials.

3. Remove temporary protection devices and facilities which were installed to protect previously completed Work.

4. Special Cleaning: Cleaning for specific units of Work is specified in applicable Sections of Specifications.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner.

E. Repairs:

1. Repair damaged protective coated surfaces.

2. Repair roads, walks, fences, and other items damaged or deteriorated because of construction operations.

3. Restore all ground areas affected by construction operations.

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SECTION 02300 - SITE PREPARATION AND EARTHWORK

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes Site preparation activities and certain items of earthwork common to other related Work.

B. Related Work Specified Elsewhere:
   1. Excavation, Filling, and Backfilling for Structures: Section 02321.
   2. Trenching and Backfilling for Utilities: Section 02322.

1.2 REFERENCES:

A. Applicable Standards:
   1. American Association of State Highway and Transportation Officials (AASHTO):
      a. M80 - Coarse Aggregate for Portland Cement Concrete.
      b. T99 – The Moisture-Density Relations of Soils Using a 5.5-Pound (2.5-kg) Rammer and a 12-Inch (305-mm) Drop.
      c. T104 - Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
      d. T180 – The Moisture-Density Relations of Soils Using a 10-Pound (4.54-kg) Rammer and an 18-inch (457-mm) Drop.
   2. American Society for Testing and Materials (ASTM):
      a. D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft3).
      b. D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
      c. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
      d. D2167 - Test Method for Density and Unit Weight of Soil In-Place by Rubber Balloon Method.
      e. D2922 - Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
      f. D3017 - Test Method for Moisture Content of Soil and Rock In Place by Nuclear Methods (Shallow Depth).
      g. D4253 - Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
      h. D4254 - Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
      i. D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

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j. D4546 - Test Methods for One-Dimensional Swell/Settlement Potential of Cohesive Soils.
k. D4632 - Test Method for Grab Breaking Load and Elongation of Geotextiles.
l. D4546 - Standard Test Methods for One-Dimensional Swell or Settlement Potential of Cohesive Soils
m. D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Method

3. Occupational Safety and Health Administration (OSHA):
   a. Part 1926 – Safety and Health Regulations for Construction.

1.3 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Geotextile materials delivered to Site are subject to the Engineer's approval.

C. Riprap, structural fill, and bedding materials delivered to the Site are subject to the Engineer's prior approval.

PART 2 PRODUCTS

2.1 EARTHWORK:

A. Materials suitable for use in embankment, structural fill and backfill include material free of debris, roots, organic matter, and frozen matter; and free of stone having any dimension greater than 3 inches:
   1. Materials may include native excavated soils or borrow materials that are:
      a. Free-draining.
      b. Materials for which impact compaction will not produce a well-defined, moisture-density relationship curve.
      c. Maximum density by impact methods will generally be less than by vibratory methods.
      d. Plasticity index no greater than 15 when tested in accordance with ASTM D-4318.
      e. Gradation as determined in accordance with ASTM D-422 as follows:

Size	Percent Passing
3 inch	100
No. 4	50-100
No. 200	15-35

B. Materials unsuitable for use in embankment and fill include all material that contains debris, roots, organic matter, frozen matter, gravel, stone, or shale particles (with any dimension greater than 2 inches in areas requiring a high degree of compaction or 4 inches in other embankment and fill areas), or other materials that are determined by

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Engineer to be too wet or otherwise unsuitable for providing a stable subgrade or stable foundation for structures.

C. Material for Embankment or Fill:
   1. Beneath structures (excluding tank and vault):
      a. Suitable on-site soils may be used, provided it is free of organic and deleterious materials.
      b. Fill material shall have plasticity index not exceeding 3 when tested in accordance with ASTM D4318.
      c. Material shall meet the following grading requirements:

Sieve Size (Square Openings)	Percent Passing by Dry Weight
1 inch	100
¾ inch	85-100
No. 4	45-95
No. 200	0-10

      d. Borrow materials shall not exhibit characteristics of high shrink-swell potential as determined from Atterberg limit tests (ASTM D4318) and/or swell/pressure tests (ASTM D4546).

   2. Beneath concrete tank and vault:
      a. Tank and vault bearing surface shall be on undisturbed soil, cleaned of all loose, disturbed material and densified prior to placement of concrete. In any areas inadvertently over-excavated, the over-excavation should not be filled with structural fill, but should be replaced with lean concrete such that the entire foundation system bears on densified native soils.

   3. Fill not defined by Paragraph 2.1.C.1.
      a. Suitable on-site soils may be used, provided it is free of organic and deleterious materials.
      b. Borrow materials shall not exhibit characteristics of high shrink-swell potential as determined from Atterberg limit tests (ASTM D4318) and/or swell/pressure tests (ASTM D4546).
      c. Rock shall be stone or hard shale found in excavations in original ledge or in pieces equal to or larger than 9 cubic feet, which cannot be broken or removed by means other than drilling and blasting, or drilling and wedging.

D. Waste materials include excess usable materials and materials unsuitable for use in the Work, in accordance with Paragraph 3.2.A.5.

E. Borrow materials include all fill materials and topsoil obtained from locations on the Site:

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1. Acceptable fill materials, granular materials, and topsoil obtained from locations arranged by Contractor with the Owner (located on the Project site) required to the extent sufficient suitable materials are not obtained from excavation and trenching.

2. Material shall be subject to approval of Engineer.

3. Borrow areas shall be as follows:

   a. Arranged for by Contractor at no additional cost to Owner.
   b. Subject to approval of Engineer.

F. Engineered Aggregates: Provide engineered aggregates of the class and quantity indicated on the Drawings, and according to the following specifications.

1. While no specific gradation is required, the various sizes of the stone shall be equally distributed within the required size range. The size of an individual stone shall be determined by measuring its long dimension. No more than 5% of the material furnished can be less than the minimum size specified nor no more than 10% of the material can exceed the maximum size specified.

G. Rip Rap material shall consist of quarry-run stone with average size stones weighing 80 to 150 pounds each. At least 90% shall weigh more than 80 pounds each.

1. Stones shall be durable, free from cracks, seams, and other defects which would tend to increase its deterioration from natural causes.

2. Objectionable quantities of dirt, sand or clay will be permitted.

2.2 GEOTEXTILES:

A. Geotextile use for stabilization shall be non-woven geotextile fabric, Type 140N, as manufactured by Mirafi, Inc., or engineer approved equal. Weight shall be 4-5 ounces per square foot, or heavier. Grab tensile strength shall be a minimum of 120 pounds.

B. Geotextile used as filter shall be non-woven geotextile fabric, Type 140N, as manufactured by Mirafi, Inc., or engineer approved equal. Weight shall be 4-5 ounces per square foot, or heavier. Grab tensile strength shall be a minimum of 120 pounds.

C. Erosion-Control Blankets: Biodegradable wood excelsior mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

1. Wood Excelsior Mat:

   a. Fiber: Curled wood excelsior of 80% six inch or longer fiber length with a consistent width of fibers evenly distributed throughout the mat. Mat shall be smolder-resistant with no chemical additives.
   b. Top and Bottom Netting: Photo degradable extruded plastic netting with maximum mesh size of ¾” x ¾”.

2. Photodegradable Plastic Mesh:

   a. Fiber: UV stabilized polypropylene fiber matrix (0.7 lbs./sq. yd.).

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b. Top Netting: Extra heavyweight UV-stabilized polypropylene (5 lbs/1000 sq. ft. approx. weight).
c. Bottom Netting: Heavyweight UV-stabilized polypropylene (3 lbs/1000 sq. ft. approx. weight).

D. Silt Fence Fabric: A synthetic filter fabric or a previous sheet of polypropylene, nylon, polyester, or polyethylene yarn, which is certified by the manufacturer or supplier as conforming to the following requirements.
1. Filtering efficiency: 85% min.
2. Tensile Strength at 20% (maximum) elongation: 30lb./linear inch (minimum)
3. Slurry Flow Rate: 0.3 gal/sq-ft/min. (minimum)
4. Fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected useable construction life.

PART 3 EXECUTION

3.1 SITE PREPARATION:

A. Clearing and Grubbing:
1. Perform clearing and grubbing as indicated or as necessary to perform excavation, trenching, embankment, borrow, and other Work required, and where desired by Contractor for subsidiary purposes subject to approval:
a. Clearing:
1) Includes felling and disposal of trees, brush, and other vegetation.
2) Conduct Work in a manner to prevent damage to property and to provide for the safety of employees and others.
3) Keep operations within property lines as indicated.
b. Grubbing:
1) Includes removal and disposal of tree stumps and roots larger than 3 inches in diameter.
2) Remove to a depth of at least 18 inches below existing grade elevation.
3) Backfill all excavated depressions with approved material and grade to drain.

B. Protection of Trees:
1. Protect tops, trunks, and roots of existing trees on Project Site which are to remain, as follows:
a. Box, fence around, or otherwise protect trees before any construction Work is started.
b. Do not permit heavy equipment or stockpiles within branch spread.
c. Trim or prune to obtain working space in lieu of complete removal when possible. Conduct operation as follows:
1) With experienced personnel.

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2) Conform with good horticultural practice.
3) Preserve natural shape and character.
4) Protect cuts with approved tree paint.

d. Grade around trees as follows:
1) Trenching: Where trenching is required around trees which are to remain, avoid cutting the tree roots by careful hand tunneling under or around the roots. Avoid injury to or prolonged exposure of roots.
2) Raising Grades: Where existing grade at a tree is below the new finished grade and fill not exceeding 16 inches is required, place 1 to 2 inches of clean, washed gravel directly around the tree trunk. Extend gravel out from trunk on all sides at least 18 inches and finish 2 inches above finished grade at tree. Install gravel before earth fill is placed. Do not leave new earth fill in contact with any tree trunks.
3) Lowering Grades: Regrade by hand to elevation required around existing trees in areas where new finished grade is to be lower. As required, cut the roots cleanly 3 inches below finished grade, and cover scars with tree paint.

e. Remove when damage occurs and survival is doubtful.
f. Replace with similar item when damaged through carelessness and so requested.

C. Demolition: Not Used.

D. Stripping:
1. Remove topsoil from areas within limits of excavation, trenching, and borrow and areas designated to receive embankment and compacted fill as follows:

a. Scrape areas clean of all brush, grass, weeds, roots, and other materials.
b. Strip to depth of approximately 6 inches or to a sufficient depth to remove excessive roots in heavy vegetation or brush areas and as required to segregate topsoil.
c. Stockpile topsoil in areas designated where it will not interfere with construction operations or existing facilities. Stockpiled topsoil shall be reasonably free of subsoil, debris, and stones larger than 2-inch diameter.

3.2 EARTHWORK:

A. Excavation:
1. Perform excavation as indicated or as required to complete the Work.

2. All materials encountered, regardless of type, character, composition, and condition thereof, shall be unclassified. Rock encountered shall be handled at no additional cost to Owner.

3. Excavations shall be sloped back to form temporary cut slopes of no steeper

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than about 1-1/2 horizontal to 1 vertical, assuming no groundwater is encountered. If groundwater is encountered, flattening and dewatering may be necessary.

4. Blasting: Not Used.

5. Stockpiling:

   a. Stockpile in amounts sufficient for and in a manner to segregate materials suitable for the following:
      1) Topsoiling.
      2) Constructing embankments and fills.
      3) Backfilling.
      4) Waste only.
   b. Do not obstruct or prevent access to:
      1) Roads and driveways.
      2) Utility control devices.
      3) Ditches or natural drainage channels.
   c. Perform in a manner to avoid endangering the Work, stability of banks or structures, or health of trees and shrubs to be saved.
   d. Maintain safe distance between toe of stockpile and edge of excavation or trench.
   e. Stockpile in other areas or off Site when adjacent structures, easement limitations, or other restrictions prohibit sufficient storage adjacent to the Work. Off-Site areas shall be arranged for by Contractor at no additional cost to Owner.

6. Waste Materials:

   a. Waste materials as described for purposes of this Contract within this Section consist of deleterious soils, rock, and other materials considered unacceptable for compaction or placement fill, and which are not environmentally contaminated. Waste materials shall not include environmental pollutants, hazardous substances, contaminated products, by-products, samples, or waste materials of any kind that are regulated under environmental laws.
   b. Remove waste materials from Work area as excavated.
   c. Deposit such materials in locations and within areas designated by Engineer and as indicated.
   d. Material shall become property of Contractor and shall be disposed of off Site at locations arranged for by Contractor.
   e. Place excavated rock in the interior of waste area fills so that it will not be exposed to view.
   f. Grade waste areas and leave them free draining and with an orderly and neat appearance.

B. Embankment:

1. Construct embankments to the contours and elevations indicated, using suitable approved material from excavations and borrow areas:

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a. Borrow:
   1) Refers to all fill materials and topsoil obtained from approved locations off the Site.
   2) Borrow shall include all excavating, handling, and final disposal of materials as specified.
   3) Borrow areas shall be:
      a) Arranged for by Contractor at no additional cost to Owner.
      b) Subject to approval.
   4) Material removed from borrow areas shall be as approved.
   5) Leave borrow areas graded to drain and to present a neat appearance.

b. Compaction:
   1) Compact embankments using equipment as required to obtain reasonable uniformity.
   2) Embankments beneath structures (excluding tank and vault):
      a) Place in 8-inch loose lifts and compact with approved compaction equipment. Lifts should be reduced to 4-inches if hand held compaction equipment is used. Each lift shall be firm and non-yielding.
      b) Compact to a minimum of 95 percent of the maximum dry density determined in accordance with ASTM D-1557 with a moisture content within 2 percent of the optimum moisture content.
   3) Embankment and backfill adjacent to structures:
      a) Use hand operated compaction equipment within a zone of about 5 feet horizontally from the back of tank or vault wall.
      b) Place in 8-inch loose lifts and compact with approved compaction equipment. Lifts should be reduced to 4-inches if hand held compaction equipment is used. Each lift shall be firm and non-yielding.
      c) Compact to a minimum of 95 percent of the maximum dry density determined in accordance with ASTM D-1557 with a moisture content within 2 percent of the optimum moisture content.
   4) Embankments not defined within Paragraph 3.2.B.1.b.(2), including landscaped areas:
      a) Compact subgrade embankments to 90% of maximum dry density within the moisture content range from 2% below optimum to 2% above optimum. Optimum moisture and maximum dry density shall be determined by ASTM D698.
   5) Moisture content shall be that required to obtain specified compaction of the soil:

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a) Perform moisture curing by wetting or drying of the material as required to attain required compaction criteria.

6) Achieve minimum densities specified.

c. Placement:

1) Place fill material in 4-inch to 8-inch layers in areas requiring a high degree of compaction and in 8-inch to 12-inch layers in other embankment areas.

2) Place embankment only on subgrades approved by Engineer.

3) Do not place snow, ice, or frozen earth in fill; do not place fill on a frozen surface.

C. Subgrades:

1. General:

a. Excavate or fill as required to construct subgrades to the elevations and grades indicated.

b. Remove all unsuitable material and replace with approved fill

c. Perform all wetting, drying, shaping, and compacting required to prepare a suitable subgrade.

d. Exposed area to receive fill, backfill, or embankment shall be proof-rolled to detect localized zones of excessively wet, unstable, organic, or low bearing capacity materials to the extent as follows:

1) Proof roll as a single-pass operation with conventional compaction equipment during subgrade preparation and prior to placement of fill, and as a spot check process without the need for complete coverage per unit area of tire. Soft spots will be over-excavated, backfilled and compacted with suitable material.

2. Subgrade for Fills and Embankment:

a. The exposed native soils at the base of the excavation should be scarified to a depth of 8 inches, moisture conditioned to the optimum moisture content to 2 percent above, and compacted to a minimum of 95 percent maximum dry density as determined in accordance with ASTM D-1557.

3. Subgrade for Access Roads and Parking Areas: See Section 02732 – Crushed Aggregate Surfacing.

4. Subgrades for Concrete Structures:

a. Excavate to the final footprint and elevation of the proposed structure. The exposed native soils at the base of the excavation should be scarified to a depth of 8 inches, moisture conditioned to the optimum moisture content to 2 percent above, and compacted to a minimum of 95 percent maximum dry density as determined in accordance with ASTM D-1557. If scarifying the bottom of the excavation is no possible due to the presence of large cobbles or boulders, the surface should be

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cleaned of any loose material from the excavation prior to construction or placement of the concrete.

D. Site Grading:
   1. Fill:
      a. Fill as required to raise existing grades outside of structures and road areas to the new grades as indicated.
      b. Such fill shall be performed as specified in Paragraph 3.2.B - Embankment.
      c. Remove all debris subject to termite attack, rot, or corrosion from areas to be filled.
   2. Rough Grading:
      a. All areas within the Project, including excavated and filled sections, and adjacent transition areas shall be reasonably smooth, compacted, and free from irregular surface changes.
      b. Degree of finish shall be that ordinarily obtained from blade grader or scraper operations, except as otherwise specified.
      c. Finished rough grades shall generally be not more than 0.5 foot above or below established grade or approved cross sections with due allowance for topsoil and sod.
      d. Tolerance for areas within 10 feet of building and areas to be paved shall not exceed 0.15 foot above or below established subgrade.
      e. Finish all ditches, swales, and gutters to drain readily.
      f. Unless otherwise indicated, slope the subgrade evenly to provide drainage away from building walls in all directions at a grade not less than 1/4 inch per foot.
      g. Provide roundings at top and bottom of banks and at other breaks in grade.

E. Aggregate Embankment, Walls and Fill:
   1. Equipment-placed rock riprap
      a. The rock riprap shall be placed by equipment on the surface and to the depth specified. It shall be installed to the full course thickness in one operation and in such a manner as to avoid serious displacement of the underlying material. The rock for riprap shall be delivered and placed in a manner that ensures the riprap in place is reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface.
      b. Rock riprap shall be placed in a manner to prevent damage to structures. Hand placing is required as necessary to prevent damage to any new and existing structures.

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F. Topsoiling:

1. Includes placement of topsoil on all areas not specified to receive paving or other surface treatment (including borrow or waste areas).

2. Materials:

   a. Those obtained from excavation which are most suitable and stockpiles for such purpose:
      1) Topsoil shall be a fertile, friable, and loamy soil of uniform quality, free from materials such as hard clods, stiff clay, stone with any dimension greater than 1 inch, and similar impurities. Relatively free from grass, roots, weeds, and other objectionable plant material.
   b. Borrow when required.

3. Subgrade Treatment:

   a. Clear Site of vegetation heavy enough to interfere with proper grading and tillage operations.
   b. Clear surfaces of all stones or other objects larger than 3 inches in thickness or diameter, all roots, brush, wire, grade stakes, or other objectionable material.
   c. Loosen subgrade by discing or scarifying to a depth of 2 inches wherever compacted by traffic or other causes to permit bonding of the topsoil to the subgrade.

4. Placement of Topsoil:

   a. Distribute over required areas without compaction in upper 1 foot, other than that obtained with spreading equipment.
   b. To extent material is available within following limits:
      1) Not less than 4 inches in depth.
      2) Do not exceed 2 feet in depth.
      3) Shape cuts, fills, and embankments to contours indicated.
      4) Grade to match contours of adjacent areas and permit good, natural drainage. Provide gentle mound over trenches.
      5) Seeding shall be in accordance with Section 02920 - Seeding.

5. Maintenance:

   a. After topsoil has been spread, clear surface of stones or other objects larger than 1 inch in thickness or diameter and all other objects that might interfere with planting and maintenance operations.
   b. Protect topsoiled areas from the elements until grass is established and repair eroded areas as required.
   c. Keep paved areas clean. Promptly remove topsoil or other dirt dropped upon surfacing.

G. Preparation and Installation for Erosion-Control Materials:

1. Prepare area as specified in "Topsoiling" Section.

2. For erosion-control blanket or mesh, install from top of slope, working

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downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

3. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

H. Dewatering:

1. General:

a. Contractor shall design and provide the dewatering system using accepted and professional methods of design and engineering consistent with the best current practice to eliminate water entering the excavation under hydrostatic head from the bottom and/or sides. The system shall be designed to prevent differential hydrostatic head which may occur from rising water levels from adjoining or nearby bodies of water, proximity of excavation to phreatic groundwater level, or surface runoff, and which would result in floating out soil particles in a manner termed as a "quick" or "boiling" condition. System shall not be dependent solely upon manholes and/or pumping water from within the excavation where differential head would result in a "quick" condition, which would continue to worsen the integrity of the excavation's stability.

b. Provide dewatering system of a sufficient size and capacity as required to control ground and surface water flow into the excavation and to allow all Work to be installed in a dry condition, including the obtaining of a licensed well-driller, where required.

c. Control, by acceptable means, all water regardless of source and be fully responsible for disposal of the water.

d. Confine all discharge piping and/or ditches to the available easement or to additional easement obtained by Contractor. Provide all necessary means for disposal of the water, including the obtaining of all necessary permits and of additional easement at no additional cost to Owner.

e. Control groundwater in a manner that preserves the strength of the foundation soils, does not cause instability or raveling of the excavation slopes, and does not result in damage to existing structures. Where necessary to these purposes, lower the water level in advance of excavation, using wells, well points, jet eductors, or similar positive methods. The water level as measured in piezometers shall be maintained a minimum of 3 feet below the prevailing excavation level.

f. Commence dewatering with means to provide positive dewatering of all water sources prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, floatation, or other causes.

g. Open pumping with manholes and ditches shall be allowed, provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.

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h. Install wells and/or well points, if required, with suitable screens and filters, so that continuous pumping of fines does not occur. Arrange the discharge to facilitate collection of samples by Contractor and Owner or Resident Project Representative. During normal pumping, and upon development of well(s), levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install a sand tester on the discharge of each pump during testing to verify that levels are not exceeded.

i. Install, operate, and maintain the dewatering system required to control surface and/or groundwater.

j. Control grading around excavations to prevent surface water from flowing into excavation areas.

k. Drain or pump as required to continuously maintain all excavations and trenches free of water or mud from any source, and discharge to approved drains or drainage channels. Commence when water first appears and continue until Work is complete to the extent that no damage will result from hydrostatic pressure, flotation, or other causes.

l. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

3.3 RIPRAP:

A. Foundation Preparation:

1. Trim and dress areas requiring riprap to conform to cross sections indicated within an allowable tolerance of +3 inches from the theoretical slope lines and grades.

2. Where such areas are below the allowable minus tolerance limit, they shall be brought to grade by filling with bedding material.

3. Do not place bedding on the base until the base has been approved.

B. Bedding:

1. Place bedding on the prepared foundation

   a. Thickness as indicated
   b. Material shall be as specified in Part 2, this Section.

2. Spread bedding uniformly on the prepared base to neat lines as indicated.

3. Placing of material by methods which will tend to segregate particle sizes within the bedding will not be permitted.

4. Repair any damage to the surface of the prepared base during placement of the bedding before proceeding with the Work.

5. Compaction of the bedding will not be required, but it shall be finished to present a reasonably even surface free of mounds, depressions, or windrows.

C. Geotextiles:

1. Geotextile shall be placed on prepared subgrades or as directed by the Engineer. At the time of installation, geotextile shall be rejected if it has defects, rips,

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holes, flaws, deterioration, or damage incurred during manufacture, transportation or storage. The geotextile shall be unrolled directly over the subgrade. Geotextile may be installed either by hand or mechanical methods provided the surface is not rutted. The geotextile shall be laid loosely and free of tension, stress, folds, wrinkles, or creases. Along the edges of the riprap blanket the geotextile shall be turned up along the vertical face of the blanket, terminating 6" below finished grade. As the riprap proceeds up the grade, the top edge of the geotextile shall be buried as a part of the last operation. Overlaps in the geotextile should be placed so that any up-slope strip of geotextile will overlap the down-slope strip, and the up-slope roll should overlap the down-slope roll. Geotextile of insufficient width or length to fully cover the specified area shall be lapped or sewn. The minimum lap for lap only areas is 12 inches and for sewn areas is 4 inches. If sewn, the geotextile shall be stitched at a minimum rate of 4 stitches per one inch with high-strength polyester, polypropylene, or Kevlar thread. The seam strength shall be equal to or more than the minimum grab tensile strength of geotextile when tested wet in accordance with ASTM D 4632. The geotextile shall be protected at all times during construction and any damage to the geotextile during its installation or during placement of riprap shall be replaced or repaired at the contractor's expense. If the geotextile is damaged during installation, the material around the rupture shall be removed and the damaged area covered with a patch of geotextile using an overlap of 4 feet in each direction. The patch shall be held in position with securing pins.

2. Cost of geotextile materials and associated work shall be incidental to the riprap.

D. Placement of riprap:
   1. Place on the slopes within the limits as indicated.
   2. Place stone for riprap on the prepared base in such a manner as to produce a reasonably well-graded mass of rock with a minimum practicable percentage of voids.
   3. Place to its full course thickness in one operation in a manner to avoid displacing the bedding material.
   4. Finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Hand-place only if necessary to secure the desired results.
   5. Maintain the riprap until accepted and replace any material displaced by any cause.

3.4 FIELD QUALITY CONTROL:

A. Compaction:
   1. Contractor shall, through services of an independent laboratory, test all embankments, fills, and subgrades under this Contract to determine

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conformance with specified density relationships.

2. Method of test may be either of the following at Engineer's option:

   a. ASTM D-1556
   b. ASTM D-6938

3. The frequency of tests shall be as required by the Engineer.

B. Subgrades:

1. Engineer will inspect all subgrades to determine conformance with indicated lines and grades.

2. Subgrades for roadways, drives, parking areas, and railroads shall have a maximum deviation of not more than 1/2 inch in any 10 feet when tested with a 10-foot straightedge applied parallel with and at right angles to the centerlines of subgrade areas, except that subgrades to receive aggregate-type surfacing shall have a maximum deviation of not more than 1 inch in any 10 feet.

3.5 PROTECTION OF THE WORK:

A. Maintenance:

1. Protect newly graded and topsoiled areas from actions of the elements.

2. Fill and repair settling or erosion occurring prior to landscaping and re-establish grades to the required elevations and slopes.

B. Correction of Backfill Settlement:

1. Under provisions of the guarantee, Contractor is responsible for correcting any settlement of backfill and damages created thereby within 1 year after acceptance of the Work.

2. Make repairs within 10 days from and after due notification by Owner of backfill settlement and resulting damage.

3. Make own arrangements for access to the Site for purposes of repair.

END OF SECTION

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SECTION 02321 - EXCAVATION, FILLING AND BACKFILLING FOR STRUCTURES

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes all necessary excavation, filling, and backfilling for structures and all related Work, including manholes.

B. Related Work Specified Elsewhere:
   1. Site Preparation and Earthwork: Section 02300.
   2. Trenching and Backfilling for Pipelines: Section 02322.
   3. Concrete: DIVISION 3.

1.2 REFERENCES:

A. Applicable Standards:
   1. American Society for Testing and Materials (ASTM):
      a. D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft3).
      b. D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
      c. D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))
      d. D4253 - Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
      e. D4254 - Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
      f. D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Method
   2. Occupational Safety and Health Administration (OSHA):
      a. Part 1926 - Safety and Health Regulations for Construction.

1.3 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Where selecting an option for excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as "OSHA Part 1926" or successor regulations, which require design by a registered professional engineer, submit (for information only and not for Engineer approval) the following:
   1. Copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located.

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2. Documents provided with evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements.

PART 2 PRODUCTS

2.1 FILL AND BACKFILL MATERIAL:

A. Refer to Section 02300 SITE PREPARATION AND EARTHWORK - PART 2.

2.2 CONCRETE:

A. Includes all concrete used to restore bottom of excavation to proper elevation, and in concrete seal coats.

B. Concrete shall be as specified in DIVISION 3.

PART 3 EXECUTION

3.1 EXCAVATION:

A. Perform as specified in Section 02300 and as follows:
   1. Notify Engineer at least 24 hours prior to start of excavation.
   2. Excavate area adequate to permit efficient erection and removal of forms.
   3. Trim to neat lines where details call for concrete to be deposited against earth.
   4. Excavate by hand in areas where space and access will not permit use of machines.
   5. Notify Engineer immediately when excavation has reached the depth indicated. Do not proceed further until approved.
   6. Restore bottom of excavation to proper elevation with compacted fill material in areas over-excavated, as approved.
   7. Use sides of trenches to form sides of duct banks where possible and where sides of trench are vertical, stable, and excavated to the proper line.

B. Sheeting and Bracing:
   1. Design, furnish, place, maintain, and subsequently remove, to the extent required, a system of temporary supports for cut and cover, open cut, or trench excavations, including bracing, dewatering, and associated items to support the sides and ends of the excavations where excavation slopes might endanger in-place or proposed improvements, extend beyond construction right-of-ways, or where specified or indicated.
   2. Provide on-Site prior to start of excavation in each section, and make such adjustments as are required to meet unexpected conditions.
   3. Space and arrange sheeting and bracing as required to exclude adjacent material and according to the stability of excavation slopes.

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4. Contractor shall make his own assessment of existing conditions including adjacent property, the possible effects of his proposed temporary works and construction methods, and shall select and design such support systems, methods, and details as will assure safety to the public, adjacent property, and the completed Work.

5. Modify or relocate Underground Facilities, at no additional cost to Owner or Engineer, if existing Underground Facilities interfere with Contractor's proposed method of support.

6. Employ caution in the areas of Underground Facilities, which shall be exposed by hand or other excavation methods acceptable to Owner.

7. Perform sheeting, shoring, and bracing for trench excavation, for Underground Facilities, and for other purposes in accordance with the safety and protection requirements of the General Conditions.

8. Provide sheeting, shoring, and bracing for trench excavation in the subgrade of the excavation to prevent movement of the main excavation support system.

9. Provide shoring, sheeting, and bracing as indicated or specified to meet the following requirements:

    a. Prevent undermining and damage to all structures, buildings, Underground Facilities, pavements and slabs.
    b. Excavations shall be accomplished with vertical banks where necessary for construction activities or as indicated, and also within all limits of excavation noted on the Drawings.
    c. Design excavation support system and components to support lateral earth pressures, unrelieved hydrostatic pressures, utility loads, traffic and construction loads, and building and other surcharge loads to allow the safe and expeditious construction of the permanent structures without movement or settlement of the ground, and to prevent damage to or movement of adjacent buildings, structures, Underground Facilities, and other improvements. The design shall account for staged removal of bracing to suit the sequence of concrete placement for permanent structures and backfill.
    d. Except as otherwise specified herein, shoring and sheeting materials may be extracted and reused at Contractor's option; however, Contractor shall remove and replace any existing structure or Underground Facility damaged during shoring and sheeting. Remove sheeting and bracing as backfill progresses. Fill voids left after withdrawal with sand or other approved material.
    e. Where shoring and sheeting materials must be left in-place in the completed Work to prevent settlements or damage to adjacent structures or as directed by Resident Project Representative, backfill the excavation to within 3 feet below the finished grade and remove the remaining exposed portion of the shoring before completing the backfill. If soldier piles and wood lagging are used for shoring, remove wood lagging to within 3 feet of finished grade in incremental steps of

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approximately 6 inches as the backfill is constructed, or to Contractor's design if more stringent. The location of all shoring and sheeting left in-place shall be documented on drawings and provided to Engineer and Owner.

10. Contractor shall be solely responsible for proper design, installation, operation, maintenance, and any failure of any component of the system. Review by Engineer of the design and data submitted by Contractor shall not relieve Contractor from full responsibility for errors therein or from the entire responsibility for complete and adequate design and performance of the sheeting and shoring system.

11. Provision for Contingencies:

    a. The performance of the components of the support system shall be monitored for both vertical and horizontal movement at least three times a week.
    b. A contingency plan or alternative procedure shall be provided for implementation, if the designed system does not adequately perform.
    c. The materials and equipment necessary to implement the contingency plan shall be kept readily available.

12. Damages:

    a. Repair all damage resulting from Contractor's excavation and remove and replace all undermined pavements with Owner-approved equal, either concrete or asphalt, at Contractor's expense.
    b. Repair all damage resulting from Contractor’s excavation and remove and replace all undermined pavements with Owner-approved equal, either concrete or asphalt, at Contractor’s expense and in accordance with Section 02300.

3.2 FILLING AND BACKFILLING:

A. Refer to Section 02300 – Site Preparation and Earthwork.

3.3 FIELD QUALITY ASSURANCE:

A. Compaction:
    1. Owner shall, through services of an independent laboratory, test all filling and backfilling for structures to determine conformance with density relationships specified.
    2. Method of test shall be as specified in Section 02300.
    3. The frequency of tests shall be as required by the Engineer.

END OF SECTION

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SECTION 02322 - TRENCHING AND BACKFILLING FOR PIPELINES

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes:
   1. Excavation, sheeting, bracing, and all operations necessary for the preparation of trenches for bedding of pipes and pipe appurtenances, conduit, and buried cable.
   2. Pipe embedments and encasements.
   3. Backfilling of trenches.

B. Related Work Specified Elsewhere:
   1. Temporary Barriers and Controls: SECTION 01530.
   2. Site Preparation and Earthwork: SECTION 02300.
   3. Excavation, Filling, and Backfilling for Structures: SECTION 02321.
   4. Pipe Installation: SECTION 02535.
   5. Concrete: DIVISION 3.

1.2 REFERENCES:

A. Applicable Standards:
   1. American Association of State Highway and Transportation Officials (AASHTO):
      a. M147 Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
      b. T99 The Moisture-Density Relations of Soils Using a 5.5-Pound (2.5-kg) Rammer and a 12-Inch (305-mm) Drop.
      c. T104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
   2. American Society for Testing and Materials (ASTM):
      a. C33 - Standard Specification for Concrete Aggregates.
      b. C88 - Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
      c. D448 - Standard Classification for Sizes of Aggregate for Roads and Bridge Construction.
      d. D698 - Moisture - Density Relations of Soils and Soil - Aggregate Mixtures, using 5.5-Pound (2.49 Kg) Rammer and 12-inch (304.8 mm) Drop.
      e. D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
      f. D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)

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g. D2167 - Test Method for Density and Unit Weight of Soil In Place by Rubber Balloon Method.
h. D2922 - Test Methods for Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth).
i. D3017 - Test Method for Moisture Content of Soil and Rock In Place by Nuclear Methods (Shallow Depth).
j. D4253 Test Method for Maximum Index Density of Soils Using a Vibratory Table.
k. D4254 Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
l. D4318 - Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
m. D4546 - Test Methods for One-Dimensional Swell/Settlement Potential of Cohesive Soils.
n. D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Method

3. Occupational Safety and Health Administration (OSHA):
   a. 26 CFR Part 1926 - Safety and Health Regulations for Construction.

1.3 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Includes, but not limited to, the following:
   1. Steel reinforcement for concrete encasement.
   2. Steel reinforcement for concrete cradle.
   3. Concrete Submittals as specified in DIVISION 3.

C. Where selecting an option for excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as 26 CFR Part 1926 or successor regulations, which require design by a registered professional engineer, submit for information only and not for Engineer approval the following:
   1. Copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located.
   2. Documents provided with evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements.

PART 2 PRODUCTS

2.1 GRANULAR PIPE EMBEDMENT:

A. Bedding Material:
   1. The bedding material shall consist of a well-graded mineral aggregate mixture

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which will provide good stability. The size range shall be from ¼-inch minimum to ¾-inch maximum, with a maximum amount of fines passing a No. 8 screen not to exceed 5% by weight and shall conform to ASTM C33 and ASTM D448, gradation size 67B. That portion greater than 3/8-inch shall contain at least 50% of the particle having three or more fractured faces.

Nominal Size	Passing by Weight
¾- inch	90-100
3/8-inch	20-55
No. 4	0-10
No. 8	0-5

2.2 TRENCH STABILIZATION MATERIAL:

A. Material shall be as follows:
   1. 2-inch minus river-run or pit-run gravel free from clay balls, roots and organic matter, well graded from course to fine, with less than 8% by weight passing a ¼-inch sieve.

2.3 CONCRETE:

A. Concrete and reinforcing steel shall conform to applicable requirements of DIVISION 3.

2.4 TRENCH BACKFILL MATERIALS:

A. Obtain from the following:
   1. Trenches and other excavations included in Project.
   2. Borrow from location off Site.
   3. As specified for pipe embedment.
   4. Combination of above.

B. Conform to Embankment and Fill per SECTION 02300 Site Preparation and Earthwork.

C. Contain sufficient fine materials to provide a dense mass free of voids and capable of satisfactory compaction.

D. Have moisture content enabling specified placement and compaction of soil.

E. Perform any wetting or drying of the material as required to obtain the specified density when compacted.

F. Blended or otherwise processed to provide required gradation and moisture content.

G. Use granular material as specified for pipe embedment under shoulders, driveways, berms, and median strips.

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2.5 GEOTEXTILE:

A. Non-woven geotextile fabric, Type 140N, as manufactured by Mirafi, Inc., or approved equal.

B. Weight shall be 4-5 oz/sy, or heavier.

C. Grab tensile strength shall be a minimum of 120 pounds.

PART 3 EXECUTION

3.1 EXCAVATION AND TRENCHING FOR PIPELINES:

A. Equipment and Methods:
   1. Types of Equipment and methods may be at Contractor's option, where structures or other facilities are not endangered.
   2. Equipment and methods shall be subject to approval of jurisdictional agency where stability or usefulness of other facilities may be impaired.
   3. Perform by hand methods when required to save or protect trees, culverts, utilities, or other structures above or below ground.
   4. Maximum length of open trench shall be limited to 50 feet in advance and to 50 feet behind pipe installation, except as approved.
   5. Blasting will be permitted.

B. Side Walls:
   1. Make vertical or slope within specified trench-width limitations below a horizontal plane 12 inches above top of pipe.
   2. Vertical or sloped as required for stability, above a horizontal plane 12 inches above top of pipe. Slope shall be 1-1/2 horizontal to 1 vertical and flatter where saturated soils are encountered.
   3. Sheet and brace where necessary. Conform to applicable requirements of SECTION 02321. Provide materials on site prior to start of excavation. Adjust spacing and arrangement as required by conditions encountered.
   4. Excavate without undercutting.

C. Trench Depth:
   1. Depth shall be sufficient to provide the minimum bedding requirements for the pipe being placed.
   2. Do not exceed the indicated depth where conditions of bottom are satisfactory.
   3. Increase depth as necessary to remove unsuitable supporting materials.

D. Trench Bottom:
   1. Protect and maintain when suitable natural materials are encountered.

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2. Remove rock fragments and materials disturbed during excavation or raveled from trench walls.

3. When, in the opinion of Owner or Engineer, the existing material in the bottom of the trench is unsuitable for supporting the pipe, excavate below the flow line of the pipe, as directed by Owner or Engineer. Backfill the trench to subgrade of pipe base with trench stabilization material specified herein. Place the trench stabilization material over the full width of the trench and compact in loose lifts not exceeding 6-inches deep to the required grade. Place geotextile material over trench stabilization material before installing pipe bedding material.

4. Restore to proper subgrade with trench-stabilization material when over-excavated:

   a. Correct, at no additional cost to Owner, when trench is over-excavated without authority or to stabilize bottom rendered unsuitable through negligence or improper operations.
   b. Placement of Trench Stabilization Material:
      1) Compact in lifts not exceeding 6-inch loose thickness:
         a) With pneumatic or vibratory equipment.
         b) To density specified for granular pipe embedment.

E. Trench Width:
   1. Excavate trench to a width which will permit satisfactory jointing of the pipe and thorough tamping of the bedding.

   2. Do not exceed following trench widths:

      a. Below a plane 12 inches above top of pipe.

Nominal Pipe Size	Depth of Cover	Maximum Trench Width	Minimum Trench Width
2”	See Dwgs.	14”	20”
4”	See Dwgs.	16”	22”
6”	See Dwgs.	18”	24”
8”	See Dwgs.	20”	26”
16”	See Dwgs.	28”	34”

      b. Above plane defined in a no maximum limit.
      c. Maximum trench-width limitations shall apply in all areas more than 3 feet from manhole or structure walls.
      d. Maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods used.
      e. Correct when over-excavated at no additional cost to Owner:
         1) Use stronger pipe or higher class embedment.
         2) Obtain approval of Engineer before proceeding.

F. Test Pits:
   1. Excavate test pits sufficiently in advance of trenching to enable adequate

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planning of construction procedure.

2. Locate as follows:

   a. Where unstable material is suspected that may require special protective measures.
   b. Where groundwater may require special handling methods.
   c. Where advisable to assess adequacy of blasting pattern.
   d. Where indicated or otherwise approved.
   e. Where interference or conflict with other utilities or structures could affect alignment of pipe.

3. With lateral dimension not less than minimum trench width specified for location excavated.

4. To depth required to obtain information desired.

3.2 DEWATERING:

A. Dewatering:

1. General:

   a. Contractor shall design and provide the dewatering system using accepted and professional methods of design and engineering consistent with the best current practice to eliminate water entering the excavation under hydrostatic head from the bottom and/or sides. The system shall be designed to prevent differential hydrostatic head which may occur from rising water levels from adjoining or nearby bodies of water, proximity of excavation to phreatic groundwater level, or surface runoff, and which would result in floating out soil particles in a manner termed as a "quick" or "boiling" condition. System shall not be dependent solely upon manholes and/or pumping water from within the excavation where differential head would result in a "quick" condition, which would continue to worsen the integrity of the excavation's stability.

3.3 PIPE EMBEDMENTS AND ENCASEMENTS:

A. Granular Pipe Embedment:

1. Pipe bedding shall be as indicated in 2.01.

2. Place granular embedment as follows:

   a. Level bottom layer at proper grade to receive and uniformly support pipe barrel throughout its length.
   b. Form shallow depression under each joint to facilitate jointing.
   c. Form depression under each joint so that no part of bell or coupling is in contact with trench when pipe is placed in position.
   d. Add second layer simultaneously to both sides of the pipe with care to avoid displacement.
   e. Complete promptly after completion of jointing operations.

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f. Substitute for any part of earth backfill to within 2 feet of final grade at Contractor's option.

3. Compact granular bedding as follows:

a. In lifts not exceeding 12 inches in compacted depth.
b. Rod, spade, or use pneumatic or vibratory equipment:
1) As required to obtain not less than 80% relative density as determined by ASTM Method D4253 and D4254.
2) Throughout depth of embedment.
3) Tamp under haunches to completely fill voids.

3.4 BACKFILLING:

A. Placement:
1. Place material in 4-inch to 6-inch layers in areas requiring a high degree of compaction and in 12-inch layers in other embankment areas.

2. Complete promptly after approval to proceed:

a. Upon completion of pipe embedment and approval to proceed.
3. Use hand methods to a horizontal plane 12 inches above top of pipe.

4. Use approved mechanical methods where hand backfill is not required.

5. Until compacted depth over conduit exceeds 3 feet, do not drop fill material over 5 feet. The distance may be increased 2 feet for each additional 1 foot of cover.

6. Do not place snow, ice, or frozen earth in fill and do not place fill on frozen surface.

B. Compaction:
1. Compact embankments using equipment as required to obtain reasonable uniformity.

2. Except as indicated otherwise, compact trench backfill beneath drainage structures, slabs, and roadway sections to 95% of maximum dry density (using the Modified Proctor Test, in accordance with ASTM D1557) within the moisture content range from 2% below optimum to 2% above optimum. Optimum moisture and maximum density shall be as determined by ASTM D698. Outside of roadways, compact trench backfill to 90% of maximum dry density (modified proctor) within the moisture content range from 2% below optimum to 2% above optimum. Optimum moisture and maximum density shall be as determined by ASTM D698.

3. Compaction shall be as obtained by normal methods and equipment during the placing and grading of layers and to the minimum density specified for particular locations.

a. Moisture content shall be that required to obtain specified compaction of the soil.

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b. Perform moisture curing by wetting or drying of the material as required to attain required compaction criteria. Backfill material may require significant mixing and manipulation to blend backfill into the moisture specification band prior to compaction.

c. Achieve minimum densities specified.

4. Backfill failing to meet required densities shall be removed or scarified and recompacted as necessary to achieve specified results.

3.5 FIELD QUALITY CONTROL:

A. Compaction: Contractor will, through services of an independent laboratory, test all trench-stabilization material, granular pipe embedment, earth-pipe embedment, and trench backfill to determine conformance with specified moisture- density relationships:

1. Method of test will be as specified in SECTION 02300.

END OF SECTION

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SECTION 02532 - UTILITY STRUCTURES

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes the following structures and related appurtenances:
   1. Manholes.

B. Related Work Specified Elsewhere:
   1. Pipe Installation: SECTION 02535.
   2. Concrete: DIVISION 3.

1.2 REFERENCES:

A. Applicable Standards:
   1. American Society for Testing and Materials (ASTM):
      a. A48 Gray Iron Castings.
      b. C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
      c. C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
      d. C478 Precast Reinforced Concrete Manhole Sections.
      e. C890 - Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
      f. C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.

1.3 SUBMITTALS:

A. Submittals shall be made as required in, DIVISION 1. In addition, the following specific information shall be provided:
   1. Structural Design Certification:
      a. Properly identified with project name, location, and date, provide written certification of the precast manufacturer's compliance with the requirements specified herein.
      b. The certification shall state that the precast units have been designed by a Professional engineer registered in the State of New Mexico. The Engineer's seal shall appear on the certification.
      c. The Engineer reserves the right to review, upon request, calculations specifically for this project for compliance with the requirements of these specifications. This review in no way relieves the Contractor or his engineer of complete responsibility for the design of the precast concrete as referred to on the drawings and these specifications.
      d. Calculations shall identify all loading and stress analysis of precast units as installed.

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PART 2 PRODUCTS

2.1 MATERIALS:

A. Concrete: Reinforced, 4250 psi. Conform to DIVISION 3.

B. Mortar:
1. Conform to ASTM C270 Type M.
2. Type II Portland Cement.
3. Proportion 1 Part Portland Cement to 1/4 part lime to not less than 2-1/4 nor more than 3 times the sum of the cement and lime used of loose damp sand.

C. Castings:
1. Manhole Steps:
a. Steel reinforced polypropylene plastic or rubber, M.A. Industries Model PS2 PF, American Step Company Model ML or approved equal.
2. Manhole Frames and Covers:
a. ASTM A48, Class 30B, pattern as specified for each structure under PART 3, this Section.
b. Interchangeable within same pattern.
3. Conform to Drawings in all essentials of design. Weight shall be within 10% of that listed for pattern.
4. Machine bearing surfaces to provide even seating.

PART 3 EXECUTION

3.1 MANHOLES:

A. Design:
1. Construct as follows:
a. Precast manhole with cast in place concrete base or precast concrete base:
1) Precast manhole shall conform to ASTM C478 with SS-S-00210 butyl sealant with external joint seam wrap around all joints, Conwrap CS-212, 6” wide or approved equal.
2) Manholes will be installed with “ice and weather shield” from the based to the manhhole frame.
b. Conform to Drawings.
c. Provide Submittal for precast concrete manholes prior to installation.
d. Caulk and repair any leaks or remove entire Work and rebuild to obtain watertight construction.

B. Manhole Frames and Cover:
1. Ring and cover shall be cast iron, 24-inch diameter cover as shown on the drawings equal to the "Denver Heavy" pattern. The word "Water" shall be cast

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into manhole covers.

2. Set frame level to proper grade on full bed of mortar.

C. Connections:

1. Install piping using Kor-N-Seal, A-Lok or equal, entrance-hole connector (water tight) of pattern approved by the Engineer.

D. Bottom Slope:

1. For wet manholes, slope floor of manhole towards the pump.

2. Form invert channel with 4,250 psi Type II Portland cement concrete. Conform to DIVISION 3.

3. Make changes in direction of flow with smooth curves of as large a radius as size of manhole permits.

4. Make changes in size and grade smoothly and uniformly.

5. Slope floor of manhole adjacent to channels as indicated.

6. Finish channel and floor bottom smoothly without roughness, irregularity, or pockets.

E. Field Testing: Per SECTION 02535.

END OF SECTION

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SECTION 02535 - PIPE INSTALLATION

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes handling, installation and testing of pipe, fittings, specials, and appurtenances as indicated or specified.

B. Related Work Specified Elsewhere:
   1. Trenching and Backfilling for Pipelines: SECTION 02322.
   2. Utility Structures: SECTION 02532.
   3. Process Pipe: SECTION 15100.
   4. Process Valves and Accessories: SECTION 15105.

1.2 REFERENCES:

A. Applicable Standards:
   1. American Water Works Association (AWWA):
      a. C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
      b. C110 Ductile Iron and Gray Iron Fittings, 3 Inches through 48 Inches, for Water and Other Liquids.
      c. C111 Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
      d. C115 Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
      e. C150 Thickness Design of Ductile Iron Pipe.
      f. C151 Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
      g. C153 Ductile Iron Compact Fittings, 3 In. Through 24 In. and 54 In. through 64 In., for Water Service.
      h. C600 Installation of Ductile-Iron Water Mains and Appurtenances
      i. C651 Disinfection of Water Mains
      j. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water Distribution.
      k. C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 Inch through 36 Inch.
      l. C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 Inch through 8 Inch.
      m. M23 - PVC Pipe-Design and Installation.
      n. M41 Ductile-Iron Pipe and Fittings.
   2. American Society for Testing and Materials (ASTM):
      a. F1417 – Installation Acceptance of Plastic Non-pressure sewer lines.
   3. International Organization for Standardization (ISO):
      a. ISO 8791-1 - Ductile iron pipes - External zinc based coating

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1.3 DELIVERY, STORAGE AND HANDLING:

A. Handle in a manner to ensure installation in sound and undamaged condition.
   1. Do not drop or bump.
   2. Use slings, lifting lugs, hooks, and other devices designed to protect pipe, joint elements, linings, and coatings.

B. Ship, move, and store with provisions to prevent movement or shock contact with adjacent units.

C. Handle with equipment capable of work with adequate factor of safety against overturning or other unsafe procedures.

D. Packaging, handling, and shipping shall be done in accordance with the manufacturer's instructions.

PART 2 PRODUCTS - SPECIFIED IN RESPECTIVE SECTIONS OF THIS DIVISION.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL:

A. Use equipment, methods, and materials ensuring installation to lines and grades indicated.
   1. Maintain within tolerances specified or acceptable laying schedule.
      a. Alignment: +1 inch per 100 feet in open cut or tunnel.
      b. Grade: +1 inch per 100 feet.
   2. Do not lay on blocks unless pipe is to receive total concrete encasement.
   3. Accomplish horizontal and vertical curve alignments with bends, bevels, and joint deflections.
   4. Obtain acceptance of method proposed for transfer of line and grade from control to the Work.

B. Install pipe of size, materials, strength class, and joint type with embedment indicated for plan location.

C. Insofar as possible, commence laying at downstream end of line and install pipe with spigot or tongue ends in direction of flow. Obtain Engineer approval for deviations therefrom.

D. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during installation and at discontinuance of installation.
   1. Close open ends of pipe with snug-fitting closures.
   2. Do not let water fill trench. Include provisions to prevent flotation should water

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control measures prove inadequate.

3. Remove water, sand, mud, and other undesirable materials from trench before removal of end cap.

E. Brace or anchor as required to prevent displacement after establishing final position.

F. Perform only when weather and trench conditions are suitable. Do not lay in water.

G. Observe extra precaution when hazardous atmospheres might be encountered.

3.2 JOINTING:

A. General Requirements:
1. Locate joint to provide for differential movement at changes in type of pipe embedment, impervious trench checks, and structures.
   a. Not more than 8 inches from structure wall, or
   b. Support pipe from wall to first joint with concrete cradle structurally continuous with base slab or footing.
   c. As indicated.
2. Perform conforming to manufacturer's recommendations.
3. Clean and lubricate all joint and gasket surfaces with lubricant recommended.
4. Use methods and equipment capable of fully seating or making up joints without damage. Do not exceed forces recommended by the manufacturer for coupling pipe.
5. Check joint opening and deflection for specification limits. Do not exceed those stated by the manufacturer.
6. Join pipes in straight alignment then deflect to required angle.
7. Manufacturer’s recommended joint deflection shall not be exceeded.

3.3 CUTTING:

A. Cut in neat manner without damage to pipe.

B. Observe Specifications regarding joint locations.

C. Cut with carborundum saw or other acceptable method per manufacturer's instructions.
1. Smooth cut by power grinding to remove burrs and sharp edges.
2. Repair lining as required and approved.

3.4 CLOSURE PIECES:

A. Connect two segments of pipeline or a pipeline segment and existing structure with short sections of pipe fabricated for the purpose.

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B. Observe Specifications regarding location of joints, type of joints, and pipe materials and strength classifications.

C. Field-fabricated closures, where required, shall be concrete encased between adjacent flexible joints.

D. May be accomplished with sleeve coupling:
   1. Of length such that gaskets are not less than 3 inches from pipe ends.

3.5 TEMPORARY PLUGS:

A. Furnish and install temporary plugs at each end of Work for removal by others when completed ahead of adjacent contract.

B. Remove from pipe laid under adjacent contract in order to complete pipe connection when work by other contractor is finished prior to work at connection point under this Contract.

C. Plugs:
   1. Test plugs as manufactured by pipe supplier.
   2. Fabricated by Contractor of substantial construction.
   3. Watertight against heads up to 20 feet of water.
   4. Secured in place in a manner to facilitate removal when required to connect pipe.

3.6 CONNECTIONS TO EXISTING STRUCTURES:

A. Connect pipe to existing structures and pipelines where indicated.

B. Prepare structure by making an opening with at least 3 inches clearance all around fitting to be inserted.

C. Observe pertinent articles of Specifications pertaining to joint locations and closures.

D. Repair wall opening with non-shrinking grout.

3.7 FIELD TESTING:

A. Acceptance Tests for Pressure Pipelines:
   1. Perform hydrostatic pressure and leakage tests.
      a. Conform to AWWA C600 procedures.
         1) As modified herein.
         2) Shall apply to all pipe materials specified.
      b. Perform after backfilling.
   2. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs.

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a. Select test segments such that adjustable seated valves are isolated for individual checking.
b. Contractor shall furnish and install test plugs.
1) Including all anchors, braces, and other devices to withstand hydrostatic pressure on plugs.
2) Be responsible for any damage to public or private property caused by failure of plugs.

3. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 1 fps.

4. Owner shall make water for testing available to Contractor at nearest source at Owner's lowest rate step.

5. Pressure and Leakage Test:

a. Test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section
b. Be at least at 2-hour duration, and maintain pressure throughout the test ± 5 psi of test pressure. Leakage test shall be conducted concurrently with the pressure test.
c. Acceptable when leakage does not exceed that determined by the following formula:
1) In English units:
L = 0.0000075 SD(P)1/2, in which
L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average actual leakage test pressure in psig
d. These formulas are based on an allowable leakage of 11.65 gpd/mile/in of nominal diameter at a pressure of 150 psi.
e. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in of nominal valve size shall be allowed.
f. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.
g. Repeat test as necessary.
1) After location of leaks and repair or replacement of defective joints, pipe, fittings, valves or hydrants. All visible leaks are to be repaired regardless of the amount of leakage.
2) Until satisfactory performance of test.
h. Owner and/or Engineer will witness pressure and leakage test.

B. Deflection Testing:
1. Maximum installed joint deflections of ductile iron pipe shall be 5 degrees.

2. Maximum installed deflections for PVC pipe shall be 3 percent of the mean internal diameter of the pipe.

3. Owner or Engineer may require Contractor to test flexible pipe after backfill

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has been in place 30 days and again after 12 months.

a. Provide rigid ball or mandrel deflection testing equipment and labor.
b. Obtain approval of equipment and acceptance of method proposed for use. Test shall be performed without mechanical pulling devices.
c. Remove and replace pipe exceeding deflection limits.

C. Acceptance Tests for Gravity and Low-Pressure Pipelines:
1. Alignment:

a. Sewer shall be inspected by physical passage.
b. Contractor shall clean pipe of excess mortar, joint sealant, and other dirt and debris prior to inspection.
c. Determine from Physical Inspection:
d. Presence of any misaligned, displaced, or broken pipe.
e. Presence of visible infiltration or other defects.
f. Correct defects as required prior to conducting leakage tests.

2. Leakage Test:

a. Contractor shall perform by exfiltration method on all pipe installed (except where air tests permitted at Contractor's option).
b. Furnish water and all facilities required including:
    1) Necessary piping connections.
    2) Test pumping equipment.
    3) Water meter.
    4) Pressure gauge.
    5) Bulkheads.
    6) All miscellaneous items required.
c. Obtain approval of equipment and acceptance of methods proposed for use.
d. Conduct initial test on first section of pipe laid by each crew.
    1) Include a minimum of 10 lengths of pipe but not to exceed 300 feet.
    2) Perform before backfilling.
    3) Satisfactorily complete test before crew is permitted to continue pipe installation.
e. Test remaining pipe in sections determined by Contractor and approved by Engineer.
f. Perform at test pressures specified as measured: not less than 4 feet of water above the invert of the sewer at the upstream manhole nor more than 20 feet of water.
g. Maintain test as necessary to locate all leaks but not less than two hours.
h. Repeat as necessary after repair of leaks and defects until leakage as measured does not exceed limits listed in gallons per inch of internal diameter per hour per 100 feet of pipe length:
    1) Gravity pipe.....0.15 gallons
i. Protect manholes and other structures by means of bulkheads to prevent bursting pressures from being applied inside the structure.

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j. Exfiltration testing of all manholes shall be performed by Contractor and shall be tested separately from the pipe.
   1) Manholes shall be tested by plugging all openings in a watertight manner which will withstand the hydrostatic pressure when manhole is filled with water.
   2) Testing shall commence 12 hours after manhole has contained the test water.
   3) Manholes having a depth greater than 25 feet shall be tested for only 25 feet head of water. Manholes 25 feet deep or less shall be tested full of water.
   4) Exfiltration shall not exceed 1.14 gallons per day per vertical foot of manhole.

k. Dewater pipe and manholes upon completion of testing.

3. Air Testing: Perform air tests at Contractor's option in lieu of exfiltration test for pipe sizes up to and including 42 inches in diameter.

   a. Furnish all facilities required including:
      1) Necessary piping connections.
      2) Test pumping equipment.
      3) Pressure gauges or manometers.
      4) Bulkheads.
      5) All miscellaneous items required.
   b. Obtain approval of equipment and acceptance of methods proposed for use.
   c. Conduct initial test on first section of pipe laid by each crew.
      1) Include a minimum of 10 lengths of pipe but not to exceed 300 feet.
      2) Perform before backfilling.
      3) Satisfactorily complete test before crew is permitted to continue pipe installation.
   d. Test remaining pipe in sections determined by Contractor and approved by Engineer.
   e. Plug ends of line and cap or plug all connections to withstand internal test pressures.
   f. Introduce low-pressure air until internal air pressure is 4.0 psi greater than the average back pressure of ground water above the pipe invert.
   g. Allow two to five minutes for air pressure to stabilize. Adjust pressure to 3.5 psi and start test.
   h. Time required for pressure to decrease 1.0 psi from 3.5 to 2.5 psig greater than the average back pressure of any ground water above the pipe invert shall not be less than the minimum test time in the following table for the given diameters:

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Specification Time for Length of Pipe Tested (Minutes:Seconds)								
Pipe Diameter (inches)	**100ft**	**150ft**	**200ft**	**250ft**	**300ft**	**350ft**	**400ft**	**450ft**
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:35	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

* For 0.5 psi pressure test drop, required test times shall be exactly one-half the values shown. If there has been no leakage (0 psig drop) after one hour of testing, the test section shall be accepted and test complete

D. Acceptance Tests for Conduits:
   1. Alignment:
      a. Sewer shall be inspected by physical passage.
      b. Contractor shall clean pipe of excess mortar, joint sealant, and other dirt and debris prior to inspection.
      c. Determine from Physical Inspection:
      d. Presence of any misaligned, displaced, or broken pipe.
      e. Presence of visible infiltration or other defects.
      f. Correct defects as required prior to conducting leakage tests.

E. Disinfection:
   1. Disinfection for Pipelines for Conveying Potable Water:
      a. Conform with AWWA C651.

END OF SECTION

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SECTION 02732 - CRUSHED AGGREGATE SURFACING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes crushed aggregate surfacing.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02300 - Site Preparation and Earthwork.

1.3 REFERENCES:

A. Applicable Standards:
   1. American Association of State Highway and Transportation Officials (AASHTO):
      a. T99 -The Moisture Density Relations of Soils Using a 5.5-Pound (2.5-kg) Rammer and a 12” (305-mrn) Drop.

   2. American Society of Testing and Materials (ASTM):
      a. D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
      b. D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3)
      c. D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Method

PART 2 PRODUCTS

2.1 AGGREGATE:

A. Crushed aggregate surfacing shall include material free of debris, roots, organic matter, and frozen matter. Material shall have no more than 15 percent passing no. 200 sieve size, 50 to 75 percent passing the #4, and no rock larger than 1-1/2 inches. The material shall have a plasticity index of less than 5.

2.2 EQUIPMENT:

A. General Requirements:
   1. Maintain all equipment, tools, and machines used in the performance of the Work required by this Section in a satisfactory working condition at all times.

   2. Equipment shall be subject to the approval of Engineer.

B. Power Rollers:
   1. Rollers shall be self-propelled, 3-wheel, or tandem-type with wheels equipped with adjustable scrapers.

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2. Weight shall not be less than 8 tons.

C. Tamping Rollers:
   1. Rollers shall consist of one or more units arranged to adapt to uneven ground surfaces.
   2. Rolling units of multiple type shall be pivoted on the main frame.
   3. When fully loaded, rollers shall exert at least 300 psi on the combined areas of tamping feet in contact with the ground.
   4. Each unit shall be equipped with a watertight cylindrical drum with length 48" or greater.
   5. Tamping feet shall project not less than 7 inches from drum surface, with feet spaced not less than 10 inches, nor more than 10 inches measured diagonally from center to center.

D. Rubber-Tired Rollers:
   1. Rollers shall consist of two axles on which are mounted not less than nine pneumatic-tired wheels, mounted so the rear group of tires do not follow in the tracks of the forward wheels but will be centered between the forward wheels.
   2. The axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading.
   3. Inflate tires uniformly.
   4. May be self-propelled.
   5. Tow with pneumatic-tired tractors or other pneumatic-tired equipment.

E. Blade graders shall be self-propelled with a wheelbase of not less than 15 feet, and a blade of not less than 10 feet.

F. Sprinkling equipment shall consist of tank trucks, pressure distributors, or other similar equipment designed to apply water uniformly and in controlled quantities to variable width of surface.

G. Hauling equipment shall consist of pneumatic-tired vehicles and dump bodies suitable for dumping materials in windrows or layers on the subgrade.

H. Tampers shall be mechanical and hand-operated, weight not less than 50 pounds, and have a face area of not more than 100 square inches.

I. Miscellaneous equipment shall consist of scarifiers, tractors, spring-tooth or spike-tooth harrows, windrow equalizers, spreaders, and other equipment suitable for construction of crushed aggregate surfacing.

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PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS:

A. Stockpiles:
   1. Clear and level storage sites prior to stockpiling.
   2. Place in the manner and at locations designated by Engineer, providing separate stockpiles for materials from separate sources.

B. Cold Weather Limitations:
   1. Crushed aggregate surfacing construction shall be prohibited when atmospheric temperature is below 35°F.
   2. Do not place crushed aggregate surfacing on frozen subgrade.
   3. Protect crushed aggregate surfacing and subgrade in freezing weather and repair areas damaged by freezing, by reshaping, and recompacting.

C. Preparation of Subgrade:
   1. Clean off all foreign substances.
   2. Correct any ruts, soft yielding spots, or any areas with inadequate compaction.
   3. Extend subgrade the full width of the roadbed plus 1 foot outside the edges of the overlying course to be placed.
   4. The exposed native soils at the base of the excavation should be scarified to a depth of 8 inches, moisture conditioned to the optimum moisture content to 2 percent above, and compacted to a minimum of 95 percent maximum dry density as determined in accordance with ASTM D-1557.
   5. Subgrades shall be rolled.

D. Grade Control: Establish and maintain by means of grade stakes at 25’ intervals, placed in lanes parallel to the centerline of the area to be surfaced and spaced so string lines may be stretched between stakes.

3.2 MIXING AND PLACING OF MATERIALS:

A. Use road-mix method:
   1. Place material without segregation of sizes and spread from spreader boxes or moving vehicles equipped to spread material in layers of uniform thickness.
   2. Add water to the extent necessary to prevent segregation during mixing operations.
   3. Add material to the mixture in such amounts and sizes as requested by Engineer.

B. Shaping and Compacting Mixed Materials:
   1. Compact in layers no less than 3 inches nor more than 7 inches thick.
   2. Roll to specified compaction requirements throughout full depth of layer with

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tamping rollers, power rollers, rubber-tired rollers, or combination.

3. Shape and smooth by blading and rolling with power roller or rubber-tired roller or both.

4. Hand-tamp in places not accessible to rolling equipment.

5. Aerate by blade graders, harrows, or other approved equipment when mixture is moistened by rain.

C. Degree of Compaction:

1. Compact to a minimum of 95 percent of the maximum dry density determined in accordance with ASTM D-1557 with a moisture content within 2 percent of the optimum moisture content.

D. Smoothness Test:

1. Surface shall show no deviation in excess of 3/8" in any 10 feet when tested with a 10' straightedge applied parallel with and at right angles to the centerlines of the paved area.

2. Correct any deviation in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as requested by Engineer.

END OF SECTION

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SECTION 02920 - SEEDING

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes the following areas of work:
   1. Preparation of areas to be seeded.
   2. Seeding.
   3. Mulching.
   4. Fertilizing.
   5. Maintenance.

B. Related Work Specified Elsewhere:
   1. Section 02300 - Site Preparation and Earthwork.

1.2 NOT USED.

1.3 SUBMITTALS:

A. Certificates:
   1. Seed and fertilizer shall be accompanied by certificate from vendors certifying they meet requirements of these Specifications, stating botanical name, percentage by weight, percentage of purity, germination, and weed seed for each grass seed species.

PART 2 PRODUCTS

2.1 TOPSOIL:

A. Specified in Section 02300.

2.2 GRASS SEED:

A. Seed for grass mixes shall be fresh, clean, new crop seed, composed of the varieties as specified, conforming to tests as specified and applied at the rate indicated.

B. All seed shall be mixed by Pawnee Buttes Seed, Inc. The seed shall be mixed in the proportions necessary to obtain the application rate specified based on pure live seed. Submit dealer's certification of composition of mixture, percentage of purity, germination, maximum weeds of each seed mix and supply total number of pounds of grass seed required per 1,000 square feet based on volume of seed mix.

C. Taos Seed Mixture:
   1. All seed species shall have a minimum purity by weight of 85% and meet the following minimum percentage requirements:

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Species Name	% in Mix	Drilled Rate (PLS lbs/acre)
Smooth Brome, Manchar	65%	
Orchardgrass, Paiute	25%	
Alsike Clover	5%	
Rocky Mountain Wildflowers, VE	5%	
TOTAL (PLS lbs/acre)	100%	15.2 (Double Rate if Broadcasted)

2. Moldy seed or seed that has been damaged in storage shall not be used.

2.3 FERTILIZER:

A. Fertilizer shall be Diammonium phosphate, soluble mixture in granular form of treated minerals with 18% nitrogen and 46% minimum available phosphoric acid (18-46-0).

B. Deliver to site in labeled bags or containers.

2.4 MULCH AND BONDED-FIBER-MATRIX:

A. Vegetative Anti-erosion Mulch: Seed free salt or threshed straw of wheat, rye, oats, barley, or other approved materials.

B. Spray-On Bonded Fiber Matrix: Composed of interlocking polyester fibers, wood fiber, and tackifier. FlexterraTM or engineer-approved equivalent.

PART 3 EXECUTION

3.1 SOIL PREPARATION:

A. Dispose of any growth, rocks, or other obstructions which might interfere with tilling, seeding, sodding, or later maintenance operations. Remove stones over 1½ inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

B. Thoroughly loosen and pulverize topsoil to a depth of at least 4 inches.

C. Grade seeding areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions to meet finish grades. Limit fine grading to areas which can be planted within immediate future.

D. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface to dry off before planting of lawns. Do not create a muddy soil condition.

E. Restore prepared areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

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F. Spread planting soil mixture to depth required to meet thickness, grades, and elevations indicated after light rolling and natural settlement.

3.2 SEQUENCE OF APPLICATION:

A. Use two independent steps for applying seed and spray-on bonded fiber matrix
   1. Step 1 – Broadcast seed and lightly mulch
   2. Step 2 – Apply spray-on bonded fiber matrix.

3.3 FERTILIZING:

A. Apply fertilizer at the rate of 5 pounds per 1,000 square feet.

B. Incorporate fertilizer into the soil to a depth of at least 2 inches by discing, harrowing, or raking, except where applied hydraulically on slopes steeper than 2 horizontal to 1 vertical.

3.4 SEEDING:

A. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

B. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.

C. Apply seed at a rate of not less than 31 pounds per acre.

D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

E. Seasonal Limitations:
   1. Perform seeding only during the following seasons:
      a. Spring thaw to June 15.
      b. September 1 to consistent ground freeze.
   2. "Spring thaw" shall be defined as the earliest date in a new calendar year in which seed can be buried ½-inch into the surface soil (topsoil) through normal drill seeding methods.
   3. "Consistent ground freeze" shall be defined as that time during the Fall months in which the surface soil (topsoil), due to freeze conditions, prevents burying the seed ½-inch through normal drill seeding operations. At no time shall seed be sown, drilled, or otherwise planted when the surface soil or topsoil is in a frozen or crusted state.
   4. Seeding at any time other than within the above seasons shall be allowed only when ordered by the Project Manager or when the Contractor submits a written request for permission to do so and permission is granted. In the request, the Contractor must agree to apply the specified seed and mulch at a rate of not less than 25% greater per unit area than the rates specified for use within the seeding season. The additional materials shall be furnished and placed at the

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Contractor's expense. The Contractor must also agree to reseed, remulch, and repair any areas seeded out-of-season which fail due to wind, erosion, lack of germination, and/or disturbance by the Contractor or his forces at no expense to the Owner.

F. Methods of Application:
   1. Dry Seeding: Spreader or seeding machine.
   2. Hydroseeding: Mix seed, fertilizer and pulverized mulch with water and constantly agitate. Do not add seed to water more than 4 hours before application:
      a. On slopes of 2 horizontal to 1 vertical or flatter, apply seed separately from fertilizer. Cover seed with soil to an average depth of ½ inch by raking or other approved methods.
      b. On slopes steeper than 2 horizontal to 1 vertical, seed and fertilizer may be applied in a single operation. Incorporation into the soil will not be required.

3.5 MULCHING AND APPLYING SPRAY-ON BONDED FIBER MATRIX:

A. Apply a mulch covering or spray-on bonded fiber matrix to all seeded areas.
   1. Vegetative mulch, if used, must be applied to a loose depth of 2 inches in
   2. Immediately following the application of the mulch:
      a. Water the seeded area in one watering, in sufficient amount to penetrate the seedbed to a minimum depth of 2 inches.
      b. Perform so as not to cause erosion or damage to the seeded surface.
   3. Spray-on bonded fiber matrix, if used, must be applied at a rate of 3500 lbs/acre.
      a. Mix bonded fiber matrix with water at a rate of 60 lbs per 150 gallons prior to application.

B. Protect seeded areas against hot, dry weather or drying winds by applying mulch or bonded fiber matrix not more than 24 hours after completion of seeding operations.

3.6 RECONDITIONING:

A. Recondition vegetation areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition vegetation areas where settlement or washouts occur or where minor regrading is required.

B. Provide fertilizer and seed as specified for new seeding areas and as required to provide satisfactorily reconditioning. Provide new planting soil as required to fill low spots and meet new finish grades.

C. Cultivate bare and compacted areas thoroughly to provide a good, deep planting bed.

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D. Remove diseased or unsatisfactory vegetation areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel, and other construction materials. Replace with new topsoil.

E. Where substantial vegetation remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps and cultivate soil, fertilize, and seed. Remove weeds before seeding or, if extensive, apply selective chemical weed killers as required. Apply a seedbed mulch, if required, to maintain moist condition.

F. Water newly planted areas and keep moist until new grass is established.

3.7 PROTECTION:

A. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until vegetation is established.

3.8 MAINTENANCE:

A. Do not mow grass. When weeds are shading out native grass seedlings, shred weeds back to height of seedlings with a rotary shredder. Do not allow weeds to exceed a height of 8 inches.

B. Remove weeds by pulling or chemical treatment.

C. Perform maintenance until the date of final acceptance.

D. Seeded Areas:
   1. Water as required by good practice and as necessary to obtain a flourishing cover.
   2. Repair any portion of the seeded surface which becomes gullied or otherwise damaged, or the seeding becomes damaged or destroyed.

3.9 ACCEPTANCE:

A. When Work is Substantially Complete, including maintenance, Engineer and Owner will, upon request, make an inspection to determine acceptability:
   1. Work may be inspected for acceptance in parts agreeable to Owner, provided Work offered for inspection is complete, including maintenance.

B. Replant rejected Work and continue specified maintenance until reinspected by Engineer and Owner and found to be acceptable.

C. Seeded lawns will be acceptable provided requirements, including maintenance, have been complied with and healthy, uniform, close stand of specified grass is established free of weeds, bare spots, and surface irregularities.

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D. The Contractor shall guarantee all work and materials for a period of one full growing season after the date of final payment under the Contract. During the guarantee period, all areas which die shall be re-seeded, by and at the expense of the Contractor, with like material.

3.10 CLEANUP:

A. Promptly remove soil and debris created by Work from paved areas. Clean wheels of vehicles prior to leaving Site to avoid tracking soil onto surfacing of roads, walks, or other paved areas.

END OF SECTION

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SECTION 03100 - CONCRETE FORMWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers designing, furnishing, erecting, and removing forms for cast-in-place concrete.

1.2 QUALITY ASSURANCE

A. Reference Standards.
   1. American Concrete Institute Standards (ACI).
      a. 301 Specifications for Structural Concrete for Buildings, Chapter 4, Formwork.
      b. 318 Building Code Requirements for Structural Concrete.
      c. 347 Recommended Practice for Concrete Formwork (Chapters 1 through 5).
      d. 117 Standard Specifications for Tolerances for Concrete Construction and Materials.
      e. 350 Code Requirements for Environmental Engineering Concrete Structures.
      f. As modified herein.

B. Design Criteria.
   1. Design formwork for loads, lateral pressure, and allowable stresses outlined in Chapter 1 of ACI 347.
   2. Limit panel deflection to l/360 of each component span to achieve tolerances specified.

C. Maximum Allowable Tolerances.
   1. Variation from plumb.
      a. Lines and surfaces of columns, piers, and walls.
         1) In any ten feet (10') of length: One-quarter inch (1/4").
         2) Entire length: One inch (1").
      b. Exposed corner columns, control-joint grooves, and other conspicuous lines.
         1) In any twenty feet (20') of length: One-half inch (1/2").
         2) Entire length: One-half inch (1/2").
   2. Variation from level or specified grade.
      a. Slab soffits, beam soffits, and ceilings.
         1) In any ten feet (10') of length: One-quarter inch (1/4").
         2) In any bay or in any twenty feet of length: Three-eighths inch (3/8").
         3) Entire length: Three-quarter inch (3/4").

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3. Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions.

   a. In any bay: One-half inch (1/2”).
   b. In any twenty feet (20’) of length: One-half inch (1/2”).
   c. Entire length: One inch (1”).

4. Refer to ACI 117 for additional requirements.

1.3 SUBMITTALS

A. Submit shop drawings indicating type of form tie to be used and proposed method of sealing form tie holes.

B. Quality Control: Submit formwork designer qualifications.

C. Submit construction joint layout and control joint layout.

D. Submit product data and Manufacturer’s instructions for corrugated paper formwork (Void Form) and accessories when required.

E. Submit embedded conduit plan indicating size and location of conduits.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. General.
   1. Where “Smooth Form Finish” or “Grout Cleaned Finish” is specified, use prefabricated plywood panel forms, job-built plywood forms, forms lines with plywood or fiberboard, or steel forms in “new and undamaged” condition. Where “Rough Form Finish” is specified, unlined wooden forms may be used.

B. Steel Forms.
   1. Symons “Steel-Ply,” Simplex “Industrial Steel Frame Forms,” Universal “Uniform,” or equal.

C. Plywood Forms.
   1. Product Standard PS1, - waterproof, resin-bonded exterior type Douglas fir.

D. Fiberboard Forms.
   1. Federal Spec LLL-B-810 - Type II tempered, waterproof, screenback, concrete form hardboard.

E. Lumber.
   1. Straight; uniform width and thickness; free from knots, offsets, holes, dents, and other surface defects.

F. Void Form System.
   1. Function: Used to create void space directly under walls, grade beams,

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structural slabs, or to properly form and contain upper portion of drilled piers or piles.

2. Composition: Corrugated paper void form materials with a moisture resistant exterior, and having an interior fabrication of a uniform, cellular configuration.

3. Provide sealed, radial, vertical edge adjacent to piers or piles.

4. Depth: As indicated on Drawings.

5. Strength: Capable of supporting the wet concrete and associated construction loads until the concrete becomes self-supporting.

    a. SureVoid Products, Inc., Englewood, CO.
    b. Or equal.

G. Chamfer Strips.
1. Clean, white pine; planed surface against concrete.

H. Form Ties.
1. Permanently embedded body type, with removable one inch (1") breakbacks, and cones on outer ends.

2. Sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders.

3. Permanently embedded type without threaded ends shall be so constructed so that removable ends are readily broken off one inch (1") back from concrete surface without damage to the concrete.

4. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows.

5. Water stop ties: For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one (1) of the following:

    a. Integral steel water stop 0.103-inch thick and 0.625-inch in diameter tightly and continuously welded to tie.
    b. Neoprene water stop three-sixteenths inch (3/16") thick and fifteen-sixteenths inch (15/16") in diameter whose center hole is one-half (1/2) diameter of tie, or a molded plastic water stop of comparable size.
    c. Water stop: Oriented perpendicular to tie and symmetrical about center of tie.
    d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.

I. Wedge Inserts.
1. Malleable iron with galvanized askew-head bolts, nuts, and washers; Hohmann and Barnard "type HW;" Richmond Screw Anchor, "Peerless;" Weston Co., "WC 50;" or equal.

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J. Polyethylene Film.
   1. ASTM E1745, 10 mil

K. Form Coating:
   1. Non-staining chemical release agent that will not damage the concrete surface.
   2. Environmentally safe, meeting Local, State, and Federal regulations and certified by Manufacturer for use in clean water treatment plants. AWWA or National Sanitation Foundation 61 certification preferable.

PART 3 EXECUTION

3.1 ERECTION

A. General.
   1. Erect forms sufficiently tight to prevent leakage of paste, and braced or tied to maintain the desired position, shape, and alignment before, during, and after concrete placement.
   2. Use adequate walers, stiffeners, and braces to ensure proper alignment.
   3. Provide temporary openings at the bottom of column and wall forms, and at other locations where necessary to facilitate cleaning and inspection.
   4. Temporary openings in wall, or column forms used to limit the free fall of concrete to a maximum of eight feet (8') shall be located to facilitate placing and compaction of the concrete. Such openings in walls shall not exceed ten feet (10') laterally to avoid moving concrete laterally more than five feet (5').
   5. If tremies of proper lengths are used for depositing concrete in walls or columns, and if thorough compaction of the concrete is obtained by other means, temporary openings for concrete placement will not be required.
   6. Whenever the top of a wall will be exposed to weathering, do not extend the forms on one side above the top of the wall; bring to true line and grade.
   7. At other locations, bring forms to a true line and grade, or provide a wooden guide strip at the proper location on the forms so that the top surface can be finished with a screed or template for concrete which is to have a specified elevation, slope, or contour.
   8. At horizontal construction joints in walls, do not extend the forms on one side more than two feet (2') above the joint.
   9. Flat, segmental forms not more than twenty-four inches (24") wide may be used for forming curved surfaces twenty-five feet (25') in diameter or larger.
   10. Where concrete is placed against rock, remove all loose pieces of rock and clean the exposed surface with a high pressure hose.
   11. Where concrete is placed against gravel or crushed rock which does not contain at least twenty-five percent (25%) material passing a No. 4 sieve, cover such surfaces with polyethylene film to protect the concrete from loss of water. Lap

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joints in the film at least four inches (4”).

12. Where concrete is placed against void form, void form is to be covered with plywood and the joints taped. Plastic sheeting is to be used at the edges and the excavation sloped away from the foundation area.

13. Do not reuse forms with damaged surfaces.

14. Locate form ties and joints in an uninterrupted pattern for smooth and uniform surface.

15. Align all form ties, horizontally and vertically, on any one structure.

B. Embedded Items.

1. Conduits, pipes, fittings, and sleeves shall be permitted to be embedded in concrete with the approval of Engineer and must satisfy all code requirements. In general, embedded conduits must meet the following unless otherwise approved by the Engineer:

   a. Embedded conduit diameter must be less than one third (1/3) of the slab or wall thickness.
   b. Spacing between conduits must be greater than three (3) times the largest conduit diameter.
   c. Conduits shall be located within the middle third of the slab or wall thickness.

2. Anchor bolts, castings, steel shapes, conduits, sleeves, masonry anchorage, and other materials that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored.

3. Install conduits in walls or slabs with reinforcement in both faces between the two (2) faces of reinforcing steel.

4. In slabs which have only a single (1) face of reinforcing steel, place conduits near the center of the slab.

5. Unless installed in pipe sleeves, provide anchor bolts with sufficient threads to permit a nut to be installed on the concrete side of the form or template.

6. Install a second nut on the other side of the form or template and adjust the two (2) nuts so the bolt will be held rigidly in proper position.

7. Assure embedments are clean when installed.

8. After concrete placement, clean surfaces of embedded items not in contact with concrete to remove concrete mortar and other foreign substances.

C. Preparation of Form Surfaces.

1. Remove mortar, grout, and other foreign material from form surfaces.

2. Coat form surfaces with form coating material before either the reinforcing steel or concrete is placed.

3. Do not allow form coating to:

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a. Stand in puddles in the forms.
b. Come in contact with the reinforcing steel.
c. Come in contact with adjacent hardened concrete against which fresh concrete is to be placed.

4. Apply form coating to steel forms as soon as they are cleaned to prevent discoloration of the concrete from rust.

D. Edges and Corners.

1. Place chamfer strips in forms to bevel exposed edges and projecting corners. Tool the top edges of walls and slabs not indicated on the Drawings to be beveled.

2. Form beveled edges for all vertical and horizontal corners of equipment bases unless indicated otherwise on the Drawings.

3. Chamfer strips shall be three-quarter inch (3/4") unless indicated otherwise on the Drawings.

E. Removal.

1. Do not remove or disturb forms until the concrete has attained sufficient strength to safely support all dead and live loads. Removal of formwork and shoring for beams, elevated slabs, and columns shall be based on compressive strength of field-cured cylinders subject to the same conditions as the beam, elevated slab, or column.

2. Retain shoring in place and reinforce as necessary to carry any construction equipment, materials, or other loads in excess of cured strength.

3. Use care in form removal to avoid surface gouging, corner, or edge breakage, and other damage to the concrete.

4. Do not commence form removal earlier than the following schedule unless approved by Engineer based on compressive strength of field-cured cylinders.

a. Walls and columns not yet supporting loads - twenty-four (24) hours.
b. Vertical sides of beams and girders - twenty-four (24) hours.
c. Bottom forms and shoring for slabs, beams, and girders under ten feet (10') clear span between supports - seven (7) days.
d. Bottom forms and shoring for slabs, beams, and girders between ten feet (10') to twenty feet (20') clear span - fourteen (14) days.
e. Bottom forms and shoring for slabs, beams, and girders over twenty feet (20') clear span - twenty-one (21) days.
f. Refer to ACI 347, Chapter 3, Paragraph 3.7.2.3 for additional requirements.

END OF SECTION

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SECTION 03200 – CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers the furnishing and installation of steel bars and welded wire fabric for concrete reinforcement.

1.2 QUALITY ASSURANCE

A. Reference Standards.
   1. American Concrete Institute Standards (ACI).
      a. 301 Specifications for Structural Concrete for Buildings.
      b. SP-66(04): ACI Detailing Manual-2004.
      c. 315 Details and Detailing of Concrete Reinforcement.
      d. 318 Building Code Requirements for Reinforced Concrete.
      e. 350 Code Requirements for Environmental Engineering Concrete Structures.
   2. Concrete Reinforcing Steel Institute (CRSI).
      a. Manual of Standard Practice.
      b. Placing Reinforcing Steel.
   3. American Society for Testing and Materials (ASTM).
      a. A510 Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
      b. A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
      c. A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
   4. American Association of State Highway and Transportation Officials (AASHTO).
   5. International Conference of Building Officials (ICBO), International Building Code, 2009.
   6. As modified herein or on the Drawings.

B. Allowable Tolerances.
   1. Fabrication Tolerances.
      a. Sheared length: Plus or minus one inch (±1”).
      b. Overall dimensions of stirrups, ties, and spirals: Plus zero to minus one-half inch (+0 to -1/2”) for concrete thickness over twenty-four inches (24”).
      c. All other bends: Plus or minus one inch (±1”).

C. Welding.
   1. Do not weld reinforcement.

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1.3 SUBMITTALS

A. Shop Drawings.
   1. Prepare in accordance with CRSI Manual of Standard Practice and ACI SP-66 Detailing Manual.
      a. Bending lists.
      b. Placing drawings.
      c. Identify all penetrations larger than six inches (6") in maximum dimension.
   2. Mechanical threaded connections.

B. Certificates.
   1. Mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered to site and indicating ASTM type and grade, actual yield strength, specified yield strength, actual tensile yield strength, and actual ultimate tensile strength.

C. Manufacturer's Literature.
   1. Manufacturer's specifications and installation instructions for splice devices.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver to site in bundles marked with tags indicating bar size and length.

B. Carefully handle and store on supports that will keep the steel from coming in contact with the ground and or vegetation.

PART 2 PRODUCTS

2.1 REINFORCEMENT BARS

A. Steel Reinforcing Bars.
   1. Includes straight bars, stirrups, ties, and spirals.
   2. Bend test.
      a. Numbers 3 through 11 bars.
         1) Meet one hundred eighty degrees (180°) bend at sixty degrees Fahrenheit (60° F.) minimum temperature without cracking when bent around pin diameter indicated.
            a) Numbers 3, 4, and 5 bars around pin diameter equal to four (4) times nominal bar diameter.
            b) Numbers 6 through 11 bars around pin diameter equal to five (5) times nominal bar diameter.
      b. Number 14 or 18 bars.
         1) Meet ninety degrees (90°) bend at sixty degrees Fahrenheit (60° F.) minimum temperature without cracking when bent around a pin diameter equal to ten (10) times nominal bar diameter.

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3. Grade.

a. ASTM A615, Grade 60.
b. Unless noted otherwise on the Drawings.

B. Tie Wire.
1. Annealed steel, ASTM A510, sixteen (16) gauge minimum.

2. Nylon, epoxy, or plastic-coated wire for use with epoxy coated rebar.

C. Bar Supports.
1. Conform to "Bar Support Specifications," CRSI Manual of Standard Practice.

2. Where concrete surface will be exposed to weather, the portions of the supports or accessories within one-half inch (1/2") of the concrete surface shall be non-corrosive or protected against corrosion (epoxy covered).

3. Plastic bar supports are not allowed.

D. Fabrication.
1. Shall be in accordance with CRSI Manual of Standard Practice except for the allowable tolerances specified herein in 1.2.B. and as modified below.

a. No plus or minus (±) tolerance shall be allowed for rebar fabricated with multiple bends.
b. Rebar with multiple bends shall be fabricated such that concrete coverage specified herein or as otherwise indicated in the Specifications or the Drawings shall be maintained.

2. Bend all bars cold.

2.2 WELDED WIRE FABRIC

A. Welded Wire Fabric.
1. Plain wire or Deformed Wire, ASTM A1064, galvanized.

2. Furnish flat sheets only, rolled sheets not permitted.

2.3 MECHANICAL SPLICES AND CONNECTIONS

A. Mechanical Threaded Connections:
1. Furnish metal coupling sleeve for splicing reinforcing in secondary members or in areas of low stress with internal threads engaging threaded ends of bars developing in tension or compression one hundred twenty-five percent (125%) of yield strength of bar. Do not use unless shown on the Drawings or authorized by the Engineer.

2. Manufacturers and products:

a. Erico Products, Inc., Cleveland, OH; Lenton Reinforcing Steel Couplers.

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b. Richmond Screw Anchor Co., Inc., Fort Worth, TX; Richmond DB – SAE Dowel Bar Splicers.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove all mud, oil, loose rust, mill scale, paint, and other foreign materials that may reduce bond of the concrete to the steel reinforcing.

B. Rust or mill scale that is "tight" will be permissible without cleaning or brushing provided weights, dimensions, cross-sectional area, and tensile properties meet requirements of ASTM A615.

C. Notify Engineer when reinforcing is ready for inspection and allow sufficient time for inspection prior to placing concrete.

3.2 INSTALLATION

A. Bar Placement.
   1. Do not place reinforcement without Engineer-approved shop drawings.
   2. Conform to CRSI "Placing Reinforcing Steel."
   3. Conform to ACI-318 "Building Code Requirements for Reinforced Concrete."
   4. Conform to ACI SP-66 "ACI Detailing Manual."

B. Bar Supports.
   1. Provide minimum number of supports as required by ACI-315.
   2. Do not use pebbles, rocks, pieces of broken stone, common or face brick, metal pipe, or wood blocks to support reinforcement.
   3. Use solid concrete bricks to support rebar on ground. Use half (1/2) concrete brick unless otherwise directed by Engineer.

C. Placement Tolerances.
   1. Clear distance to formed surface: See 3.2.D. Concrete Cover.
   2. Spacing between bars: Refer to ACI 318.
   3. Top bars in slabs and beams: See 3.2.D. Concrete Cover.
   4. Crosswise of members: Refer to ACI 318.
   5. Lengthwise of members: Refer to ACI 318.
   6. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: One (1) bar diameter unless otherwise reviewed by Engineer.

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D. Concrete Cover.
   1. Except as otherwise indicated on the Drawings, provide the following minimum concrete cover for reinforcement.
      a. Unformed surfaces adjacent to excavation: Three inches (3”).
      b. Formed or top surfaces exposed to weather; submerged, or in contact with earth: Two inches (2”) unless otherwise shown on the Drawings.
      c. Other Locations: Refer to ACI 350 for conditions not listed herein.
   2. Cover for reinforcing steel shall not be less than the minimum given above (no minus tolerance) and shall not exceed the minimum by more than one-quarter inch (1/4”) where concrete thickness is twenty-four inches (24”) or less or more than one-half inch (1/2”) where the concrete thickness is more than twenty-four inches (24”).

E. Reinforcing Adjustment.
   1. Move only as stated under 3.2.C.6.
   2. Do not heat, bend, or cut bars unless reviewed by the ENGINEER.

F. Splicing.
   1. Do not splice bars except at locations shown on the Drawings, unless reviewed by the Engineer.
   2. Minimum lay distance shall be as shown on the Drawings. If not shown, splices shall be as specified in ACI 318.
   3. Tie splices securely to prevent displacement during placement of concrete.
   4. Stagger splices in adjacent bars.
   5. All wall corner and intersection reinforcing bars shall be continuous around corners and through columns or pilasters. Reinforcing bars shall be extended into connecting wall and hooked/lapped on the opposite face of the connecting wall.
   6. Unless indicated otherwise, Contractor may splice continuous suspended slab or longitudinal beam bars at locations of his choosing, except that top bar splices shall be located at midspan and bottom bar splices shall be located at supports.

G. Welded Wire Fabric.
   1. Install in longest practicable length.
   2. Lap adjoining pieces one full mesh plus two inches (2”) minimum.
   3. Do not make laps midway between simply supported members, or directly over support members of continuous structures.
   4. Offset laps in adjacent widths to prevent contiguous laps.
   5. Extend fabric through contraction joints and construction joints unless otherwise indicated on the Drawings.

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H. Reinforcement Around Openings: All openings in concrete walls and slabs greater than or equal to eight inches (8") shall be provided with opening reinforcement per the standard detail located on the Drawings. Place an equivalent area of steel bars around each pipe or opening and extend as shown on the Drawings.

I. Mechanical Splices and Connections.
   1. Use only in areas specifically approved in writing by the Engineer.
   2. Install as required by Manufacturer with threads tightened and in accordance with ICBO Research Report.
   3. Maintain minimum edge distance and concrete cover.

END OF SECTION

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03251 - EXPANSION, CONSTRUCTION AND CONTROL JOINTS

PART 1 GENERAL

1.1 REFERENCES

A. The following is a list of standards that may be referenced in this section:
   1. American Society for Testing and Materials (ASTM):
      a. A36, Standard Specification for Structural Steel.
      b. A653, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
      c. D226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
      d. D227, Standard Specification for Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing.
      e. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
      f. D1056, Standard Specification for Flexible Cellular Materials- Sponge or Expanded Rubber.
      g. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
      h. ASTM D2000 Standard Classification System for Rubber Products in Automotive Applications.
   2. National Sanitation Foundation International (NSF): NSF/ANSI 61, Drinking Water System Components, Health Effects.

1.2 SUBMITTALS

A. Shop Drawings:
   1. Plastic Type Water Stops: Details of splices to be used and method of securing water stop in the forms and supporting water stop so as to maintain proper orientation and location during concrete placement.
   2. Construction Joints: Layout and location indication type to be used.
   3. Joint fillers for horizontal and sloped joints.
   4. Preformed control joints.
   5. Water stop.

B. Samples: Splice, joint, and fabricated cross of each size, shape, and fitting of water stop(s) proposed for use.

C. Quality Control Submittals:
   1. Joint Filler for Potable Water Structures: Copy of applicable NSF listing.
   2. Water stop Manufacturer's written instruction for product shipment, storage, handling, installation, field splices, and repair.

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3. Joint Filler and Primer: Manufacturer's written instruction for product shipment, storage, handling, application, and repair.

4. Preformed Control Joint: Manufacturer's written instructions for product shipment, storage, handling, application, and repair.

D. ANSI/NSF 61 Standard 61 Certification.
1. For potable water holding structures, submit evidence that all construction materials have been certified under ANSI/NSF 61 or that they meet a standard consistent with ANSI/NSF 61 as approved by the New Mexico Environment Department.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Acceptance of pourable joint filler for potable water structures by federal EPS or by a state health agency.
1. Pourable Joint Filler: Certified as meeting NSF/ANSI 61.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site: Verify that water stops delivered are in accordance with cross-section dimensions as shown and Manufacturer's product data prior to unloading and storing onsite.

PART 2 PRODUCTS

2.1 PLASTIC WATER STOP

A. Extruded from an elastomeric plastic compound of which the basic resin shall be polyvinylchloride (PVC). Reclaimed PVC in the compound is not acceptable.

B. Specific Gravity: Approximately 1.37.

C. Shore Durometer Type A Hardness: Approximately 80.

D. Performance Requirements: Corps of Engineers' Specification CRD-C-572.

E. Type: Center bulb with a number of parallel ribs or protrusions on each side of strip center.

F. Corrugated or tapered type water stops are not acceptable.

G. Thickness: Constant from bulb edge to the outside stop edge.

H. Minimum Weight per Foot of Water Stop:
1. 0.90 pound for 3/16-inch by 4-inch.

2. 1.62 pounds for 3/8-inch by 6-inch.

3. 2.30 pounds for 3/8-inch by 9-inch.

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I. Manufacturers and Catalog Numbers.

1. Vulcan Metal Products, Inc., Construction Materials Division, Birmingham, AL; Catalog No. 3/81-15M: Type 8067 (4-inch by 3/15-inch), Type 8069 (6-inch by 3/8-inch), and Type 8070 (9-inch by 3/8-inch).

2. Vinylex Corp., Knoxville, TN; Catalog No. 03250/VIN (1987): No. RB6-38H (6-inch by 3/8-inch) and No. RB9-38H (9-inch by 3/8-inch).

3. Greenstreak Plastic Products, St. Louis, MO; Catalog No. 03250/GRD (1987): Style 732 (6-inch by 3/8-inch) and Style 735 (9-inch by 3/8-inch).

4. A.C. Horn, Inc., Beltsville, MD; Catalog No. CSP-162 (1987): Type 3 (4-inch by 3/16-inch), Type 9 (6-inch by 3/8-inch), and Type 10 (9-inch by 3/8-inch).

2.2 HYDROPHILIC WATER STOP FOR NON-MOVING CONSTRUCTION JOINTS

A. Continuously submerged joints.

1. Hydrotite hydrophilic water stop as supplied by Greenstreak or equivalent. Water stop to be dual extrusion Type CJ-0725-3K, 0.28 inches high by 0.98 inches wide.

2. Material shall be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties.

3. Water stop shall have a delay coating to inhibit initial expansion due to moisture present in fresh concrete.

4. Physical and performance requirements:

CHLOROPRENE RUBBER		
Property	Test Method	Required Limits
Tensile Strength	ASTM D-412	1275 PSI min.
Ultimate Elongation	ASTM D-412	350 % min.
Hardness	ASTM D-2240	55 +/- 5 Shore A

MODIFIED CHLOROPRENE (HYDROPHILIC) RUBBER		
Property	Test Method	Required Limits
Tensile Strength	ASTM D-412	300 PSI min.
Ultimate Elongation	ASTM D-412	600 % min.
Hardness	ASTM D-2240	55 +/- 5 Shore A
Expansion Ratio	Volumetric Change Distilled water @ 70°F	3 to 1 min.

B. Other Locations: Henry Synko-Flex SF302, or equal.

2.3 BOND BREAKER

A. Tape for Expansion Joints: Adhesive-backed glazed butyl or polyethylene tape, same width as the joint that will adhere to the premolded joint material or concrete surface.

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B. Use either bond breaker tape or a bond prevention material as specified in Section 03300 – Cast-In-Place Concrete, except where a tape is specifically called for.

2.4 PREMOLDED JOINT FILLER

A. Bituminous Type: ASTM D994 or D1751.

B. Sponge Rubber: Neoprene, closed-cell, expanded; ASTM D1056, Type 2C5, with a compression deflection, twenty-five percent (25%) deflection (limits), 119 to 168 kPa (17 to 24 psi) minimum.
   1. Manufacturer and Product: Rubatex International; R451N.
   2. Or equal.

2.5 POURABLE JOINT FILLERS

A. Filler for Water-Holding Structures:
   1. For use in potable water structures, meet requirements of NSF/ANSI 61.
   2. Multicomponent sealant, self-leveling or nonsag as required for level, sloping, or vertical joints.
   3. Color: White.
   4. Manufacturers and Products:
      a. Sika Chemical Co., Lyndhurst, NJ; Sikaflex-2C or Sikaflex-1A.
      b. Polymeric Systems, Inc., Phoenixville, PA; PSI-270/RC-270 Multi-Component Reservoir Sealant or RC-270 Gun Grade Reservoir Sealant, with PSI Primer #67.

2.6 STEEL EXPANSION JOINT DOWELS

A. Dowels: ASTM A36 round smooth steel bars.

B. Bar Coating: Two-coat System No. 29A, Fusion Bonded, Steel Dowel Coating. Epoxy-polyamide as specified in Section 09900 – Protective Coatings, with a factory-applied lubricating coating.

2.7 ACCESSORIES

A. Joint Sealants:
   1. Comply with Federal Specification TT-S-00227 and ASTM C290.
   2. Nonsag.
      a. Submerged.
         1) Polymeric Systems Inc: PSI-270/RC270.
      b. Nonsubmerged.
         1) Polymeric Systems Inc: PSI-270/RC270.
         2) Tremco: Dymeric 240FC.

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3. Self-Leveling.

a. Nonsubmerged applications only.
1) Polymeric Systems Inc: PSI-270SL/RC 270SL
2) Tremco: THC-901.

4. Primer. As recommended by sealant manufacturer.

5. Backup Material. As recommended by the sealant manufacturer.

B. Nonshrink Grout:
1. As specified in Section 03600 - Grout.

2. Compatible with joint sealant.

C. Roofing Felt: ASTM D226, Type II, 30-pound asphalt-saturated or equal weight of ASTM D227 coal-tar saturated felt.

D. Reinforcing Steel: As specified in Section 03200 – Concrete Reinforcement.

E. Nails: As required for securing bituminous type premolded joint filler.

F. Masking Tape: As required to temporarily adhere to concrete at each side of joint to receive filler.

G. Bearing Pad: Neoprene meeting ASTM D2000, Type BC 420.

H. Sponge Rubber: Neoprene, closed-cell, expanded meeting ASTM D1056, Type 2C5 with a compression deflection, twenty-five percent (25%) deflection (limits) 119-168 kVA, (17 to 24 psi) minimum.

PART 3 EXECUTION

3.1 GENERAL

A. Construct straight joints; make vertical or horizontal, except where walls intersect sloping floors.

B. Commence concrete placement after the joint preparation is complete.

3.2 SURFACE PREPARATION

A. Construction Joints: Prior to placement of abutting concrete, clean contact surface:
1. Remove laitance and spillage from reinforcing steel and dowels.

2. Roughen surface to a minimum of one-quarter inch (1/4”) amplitude:

a. Sandblast after the concrete has fully cured.
b. Water blast after the concrete has partially cured.
c. Green cut fresh concrete with high pressure water and hand tools.

3. Perform cleaning so as not to damage water stop, if one is present.

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B. Expansion Joint with Pourable Filler:
   1. Use motorized wire brush or other motorized device to mechanically roughen and thoroughly clean concrete surfaces on each side of joint from plastic water stop to the top of the joint.
   2. Use clean and dry high pressure air to remove dust and foreign material, and dry joint.
   3. Prime surfaces before placing joint filler.
   4. Avoid damage to water stop.

C. Expansion Joint without Pourable Filler:
   1. Coat concrete surfaces above and below plastic water stop with bond breaker.
   2. Do not damage water stop.

D. Control Joint.
   1. Coat concrete surfaces above and below plastic water stop with bond breaker.
   2. Do not damage water stop.
   3. Furnish correct type and size of reinforcing and dowels.

3.3 INSTALLATION OF WATER STOPS

A. General:
   1. Join water stops at intersections to provide continuous seal.
   2. Center water stop on joint.
   3. Secure water stop in correct position to avoid displacement during concrete placement.
   4. Repair or replace damaged water stop.
   5. Place concrete and vibrate to obtain impervious concrete in the vicinity of all joints.
   6. Joints in Footings and Slabs:
      a. Ensure that space beneath plastic water stop is completely filled with concrete.
      b. During concrete placement, make a visual inspection of the entire water stop area.
      c. Limit concrete placement to elevation of water stop in first pass, vibrate the concrete under the water stop, lift the water stop to confirm full consolidation without voids, then place remaining concrete to full height of slab.
      d. Apply procedure to full length of plastic water stops.

B. Plastic Water Stop:
   1. Install in accordance with Manufacturer’s written instructions.

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2. Splice in accordance with the water stop Manufacturer's written instructions using a thermostatically controlled heating iron. Butt splice unless specifically detailed otherwise.

    a. Allow at least ten (10) minutes before the new splice is pulled or strained in any way.
    b. Finished splices shall provide a cross-section that is dense and free of porosity with tensile strength of not less than eighty percent (80%) of the unspliced materials.

C. Hydrophilic Water Stop.
1. Install in accordance with Manufacturer's written instructions.

    a. Bond to concrete surfaces with adhesives recommended by Manufacturer.
    b. Grind concrete surface as required to provide smooth, even bonding surface for water stop.
    c. Use concrete nails at six-inch (6") maximum spacing in conjunction with adhesive for attachment of water stop in all vertical and overhead applications.
2. Splice and join in accordance with manufacturer's recommendations.

    a. Provide cyanacrylate adhesive (super glue) for butt jointing and mitering.
    b. Cut ends square (or at proper angle for mitered corners) and fit splices together without overlaps.
    c. Seal watertight any exposed cells of the water stop as recommended by Manufacturer
3. Provide concrete cover as specified by manufacturer, 3-inches minimum.
4. Provide two rows of hydrophilic waterstop around pipes and pipe sleeves at all pipe penetrations.

3.4 EXPANSION JOINT INSTALLATION

A. General:
1. Place bond breaker above and below water stop when premolded joint filler and pourable joint filler is not used.

2. Premolded Joint Filler:

    a. Sufficient in width to completely fill the joint space where shown.
    b. If a water stop is in the joint, cut premolded joint filler to butt tightly against the water stop and the side forms.
3. Precut premolded joint filler to the required depth at locations where joint filler or sealant is to be applied.

4. Form cavities for joint filler with either precut, premolded joint filler, or smooth removable accurately shaped material. Entire joint above water stop, in slabs, shall be formed and removed so that entire space down to water stop can be filled with the pourable joint filler.

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5. Vibrate concrete thoroughly along the joint form to produce a dense, smooth surface.

B. Bituminous Type Premolded Joint Filler:
   1. Drive nails approximately one-foot six-inches (1'-6") on center through the filler, prior to installing, to provide anchorage embedment into the concrete during concrete placement.
   2. Secure premolded joint filler in forms before concrete is placed.
   3. Install in walkways, at changes in direction, at intersections, at each side of driveway entrances, and at forty-five-foot (45') intervals, maximum.

C. Pourable Joint Filler:
   1. General: Install in accordance with the Manufacturer's written instructions, except as specified below:
      a. Apply primer prior to pouring joint filler.
      b. Fill entire joint above the water stop with joint filler as shown.
      c. Use masking tape on top of slabs at sides of joints; clean spillage. Remove masking tape afterwards.
   2. Rubber Asphalt Type, Hot-Applied:
      a. Heat filler material in a double-walled boiler.
      b. Place filler in the joint by means of a nozzle from a portable pouring type container to prevent spillage outside of the joint.
      c. Begin pouring joint filler at the bottom of the horizontal joint and proceed upwards in a manner that will preclude the possibility of trapping air in the joint.
   3. Rubber Asphalt Type, Cold-Applied: Place cold-applied, two-component fillers in accordance with Manufacturer's written instructions.
   4. Multicomponent Type for Potable Water Structures: Install in accordance with Manufacturer's written instructions.

D. Steel Expansion Joint Dowels:
   1. Install coated and lubricated bars parallel to wall or slab surface and in true horizontal position perpendicular to the joint in both plan and section view, so as to permit joint to expand or contract without bending the dowels.
   2. Secure dowels tightly in forms with rigid ties.
   3. Install reinforcing steel in the concrete as shown to protect the concrete on each side of the dowels and to resist any forces created by joint movement.

3.5 CONTROL JOINT INSTALLATION

A. Locate reinforcing and dowels as shown.

B. Install PVC water stop.

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C. Concrete surfaces shall be dense and smooth.

D. Apply bond breaker to concrete surfaces above and below water stop.

END OF SECTION

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SECTION 03300 – CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers cast-in-place concrete, including furnishing materials, transporting, placing, finishing, curing, and other appurtenant items of construction.

B. Inform Engineer at least forty-eight (48) hours in advance of time and places at which Contractor intends to place concrete.

1.2 QUALITY ASSURANCE

A. Reference Standards.
   1. Except as noted or modified in this Section, all concrete materials, transporting, placing, finishing, and curing shall conform to the requirements of the following standard specifications.
      a. Federal, State, and Local codes, regulations, and ordinances.
      b. American Concrete Institute Standards (ACI).
         1) 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
         2) 301 Specifications for Structural Concrete.
         3) 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete.
         4) 304.2 Placing Concrete by Pumping Methods.
         5) 305 Guide to Hot-Weather Concreting.
         6) 305.1 Specification for Hot Weather Concreting.
         7) 306 Guide to Cold-Weather Concreting.
         8) 306.1 Standard Specification for Cold Weather Concreting
         9) 309 Guide for Consolidation of Concrete.
         10) 350 Code Requirements for Environmental Engineering Concrete Structures.
         11) 350.5 Specifications for Environmental Concrete Structures
         12) 546 Concrete Repair Guide.
      c. Portland Cement Association, (PCA).
      d. American Society for Testing and Materials (ASTM).

B. CONTRACTOR shall keep at least one (1) copy of above listed ACI publications, latest edition, in the project field office at all times.

C. In case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent conditions as determined by the Engineer shall govern.

D. Qualifications:
   1. Mix Designer: Professional Engineer registered in the state in which the project

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is located.

2. Batch Plant: Currently certified by the National Ready Mixed Concrete Association.

3. Epoxy Injection Applicator: Certified by epoxy manufacturer.

E. Pre-construction Meeting:

1. Prior to installation of concrete, a jobsite meeting shall be conducted with the Engineer, Contractor, concrete subcontractor, installers of related work, and other involved entities.

2. Agenda shall include:

   a. Mix designs, test of mixes, and Submittals.
   b. Placement methods, techniques, equipment, and consolidation.
   c. Water/Cement ratio.
   d. Entrained air.
   e. Slump and placement time.
   f. Finishing and curing.
   g. Admixture types, dosage, performance, and redosing.
   h. Other specified requirements.

1.3 SUBMITTALS

A. All submittal information shall be current and completed no more than one (1) year prior to commencing any related work activities.

B. Product Data: Manufacturer's data, recommendations, and instructions for specific use on this project for products listed below.

1. Admixtures.

2. Bonding agents.

3. Bond breaker.

4. Patching materials.

C. Proposed Mix Design.

1. The mix design must be approved by Engineer prior to commencing concrete work. Submit certified test reports describing proposed concrete mix design, including:

   a. Fine aggregate - Source, type, gradation, deleterious substances, and bulk-specific gravity on the basis of weight of saturated surface dry aggregate (ASTM C128).
   b. Coarse aggregate - Source, type, gradation, deleterious substances, and bulk-specific gravity on the basis of weight of saturated surface dry aggregate (ASTM C127).
   c. Reactive aggregate test reports. (ASTM C1260, C1293, or other test approved by Engineer).

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d. Ratio of fine to total aggregates.
e. Weight (saturated surface dry) of each aggregate per cubic yard.
f. Total water content in gallons per cubic yard and proposed source.
g. Slump on which design is based.
h. Brand, type, and quantity of cement.
i. Brand, type, and quantity of admixtures.
j. Air content on which design is based.
k. Two (2) sets of compression test cylinders (two (2) 6-inch by 12-inch cylinders or three (3) 4-inch by 8-inch cylinders per set) shall be made for each proposed mix.
    1) Test one (1) set of cylinders at age seven (7) days and other set at twenty-eight (28) days.
l. Statement of intended use for mix.
m. Submit one (1) copy of a representative concrete batch trip ticket.
n. Signature of qualified mix designer.

D. Liquid holding basin repair methods: As necessary if water-holding basins fail tests as specified. Leaking cracks shall be repaired by the epoxy injection process.

E. Cold weather curing and protection: Detailed plan for cold weather curing and protection of concrete to be placed and/or cured in weather below 40 degrees Fahrenheit (40° F.). Include requirements and recommendations of ACI 306 and ACI 318 for minimum seven (7) days.

F. Hot weather curing and protection: Detailed plan for hot weather curing and protection of concrete to be placed and/or cured in weather above 80 degrees Fahrenheit (80° F.). Include requirements and recommendations of ACI 305 and ACI 318 for minimum seven (7) days.

G. Patching procedures: As necessary if defects occur in the as-cast and cured concrete to obtain finish specified.

H. Cylinder Compression Test Reports.
1. Submit two (2) copies of certified test reports to ENGINEER for air content and concrete compression testing.

I. Ready-mix Delivery Tickets.
1. Submit delivery tickets for each load at the time of delivery indicating the following:
    a. Quantity delivered, batch plant name, and batch time.
    b. Mix design used including design strength.
    c. Outdoor temperature in shade.
    d. Time at which water was added.
    e. Elapsed time between when water was added and concrete load was in place.
    f. Amount of initial water added.

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g. Amount of supplemental water that may be added without exceeding specified water/cement ratio.

h. Name of individual authorizing supplemental water and quantity of supplemental water added.

i. Numerical sequence of delivery by indicating cumulative yardage delivered on each ticket.

J. Placement Schedule.

1. Submit placement schedule showing placement location, placement quantity, penetration locations, and embedment types and locations no later than three (3) weeks prior to intended placement date.

K. ANSI/NSF 61 Standard 61 Certification.

1. For potable water holding structures, submit evidence that all construction materials used in the concrete have been certified under ANSI/NSF 61 or that they meet a standard consistent with ANSI/NSF 61 as approved by the New Mexico Environment Department.

a. Concrete supplier must submit evidence of testing concrete produced with the submitted mix design including all constituents and admixtures that will be used for the project. The testing must be performed by a qualified third party using a procedure approved by the New Mexico Environment Department and the results must demonstrate compliance with ANSI/NSF 61.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Cement.

1. Store in weathertight enclosures and protect against dampness, contamination, and warehouse set.

2. Do not use cement that has become caked or lumpy.

B. Aggregates.

1. Stockpile to prevent excessive segregation or contamination with other sizes of aggregates.

2. Use only one (1) supply source for each aggregate stockpile.

3. The bottom six inches (6”) of all aggregate piles in contact with the ground shall not be used.

C. Admixtures.

1. Store to prevent contamination, evaporation, or damage.

2. Protect liquid admixtures from freezing or harmful temperature ranges.

3. Agitate emulsions before use.

D. Rubber and Plastic Materials.

1. Store in cool place away from direct sunlight.

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E. Mixing and Transporting Ready-mixed Concrete.

1. Maximum elapsed time from time water is added to mix until concrete is in place shall not exceed one and one-half (1-1/2) hours when concrete is transported in revolving-drum trucks.

1.5 JOB CONDITIONS

A. Environmental Requirements.

1. Do not place concrete during rain, sleet, or snow unless adequate protection is provided and Engineer's approval is obtained.

2. Do not allow rain water to increase mixing water or damage surface finish.

B. Cold-Weather Concreting - Conform to ACI 306.

1. Temperature of concrete when placed shall not be less than following:

Sections with Least Dimension Under Twelve Inches (12")	**Sections with Least Dimension Twelve Inches (12") and Over**
55° F.	50° F.

2. When placed, heated concrete shall not be warmer than eighty degrees Fahrenheit (80° F.).

3. Before placing concrete, all ice, snow, and surface and subsurface frost shall be removed. The temperature of the surfaces to be in contact with the new concrete shall be raised above thirty-five degrees Fahrenheit (35° F.) for a minimum of twelve (12) hours.

4. Protect concrete from freezing during specified curing period.

5. Keep forms on for a minimum of five (5) days unless water curing.

6. Heated enclosures shall be strong and windproof to ensure adequate protection of corners, edges, and thin sections.

7. Do not permit heating units to locally heat or dry the concrete.

8. Do not use combustion heaters during the first twenty-four (24) hours unless the concrete is protected from exposure to exhaust gases that contain carbon dioxide.

9. When the ambient air temperature is below fifty degrees Fahrenheit (50° F.), slabs in protective enclosures may utilize membrane curing or film curing in accordance with Section 3.8 for the entire curing period.

10. Cold weather protection shall maintain a minimum concrete surface temperature of fifty degrees Fahrenheit (50° F.) for a minimum of seven (7) days. See ACI 306 for requirements on allowable temperature differential during the curing period.

11. Maximum allowable gradient drop in the first twenty-four (24) hours after

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curing period and end of protection is fifty degrees Fahrenheit (50° F.) for sections with a least dimension under twelve inches (12") and forty degrees Fahrenheit (40° F.) for sections with a least dimension of twelve inches (12") or greater.

12. Provide maximum and minimum thermometers placed on concrete surfaces spaced throughout Work to allow monitoring of concrete surface temperatures representative of Work.

13. Refer to ACI 306 for further requirements.

C. Hot-Weather Concreting - Conform to ACI 305.

1. Take precautions when ambient air temperature is ninety degrees Fahrenheit (90° F.) or above.

2. Temperature of concrete at the time of placement shall not exceed ninety degrees Fahrenheit (90° F.).

3. Cool forms and reinforcing to a maximum of ninety degrees Fahrenheit (90° F.) by spraying with water before placing concrete.

4. Do not use cement that has reached a temperature of one hundred seventy degrees Fahrenheit (170° F.) or more.

5. Prevent plastic shrinkage and cracking due to rapid evaporation of moisture.

6. Do not place concrete when evaporation rate (actual or anticipated) equals or exceeds 0.20 pounds per square foot per hour, as determined by Figure 2.1.5 of ACI 305.

7. Set-retarding and water-reducing admixtures may be used with Engineer's approval when ambient air temperature is ninety degrees Fahrenheit (90° F.) or above to offset accelerating effects of high temperature.

8. Water cure will be required for all flat slabs.

9. Refer to ACI 305 for further requirements.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: Furnish from one (1) source.

1. Portland Cement Type II, Type I/II, or Type I/II/V.

   a. Meet ASTM C150.
   b. Alkalies: Maximum 0.60 percent.
   c. Tricalcium Aluminate Content: Type II and Type I/II Cement - Maximum eight percent (8%). Type I/II/V cement – maximum five percent (5%).
   d. Nonhydraulic Above-grade Structures: Type II, Type I/II.
   e. Hydraulic and Below-grade Structures and Sewers: Type II, Type I/II.

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f. Combine fly ash with cement at batch plant or during production of cement in accordance with ASTM C595, Type IP cement.

B. Aggregates: Furnish from one (1) source.
1. Aggregates shall not be potentially alkali-silica reactive as defined in Appendix X1 of ASTM C33 unless otherwise approved by Engineer.
2. Fine aggregate – ASTM C33.
3. Coarse aggregate – ASTM C33 except that air-cooled blast furnace slag will not be allowed.
a. Nominal maximum size of coarse aggregate shall not be larger than:
1) One-fifth (1/5) of narrowest dimension between sides of forms, nor
2) One-third (1/3) of depth of slabs, nor
3) Three-fourths (3/4) of minimum clear spacing between reinforcing bars, bundles, or bars; minimum cover on formwork for columns, beams, girders, and walls, nor
4) One inch (1") for slabs having No. 6 or smaller bars.
5) Three-fourths inch (3/4") minimum unless otherwise approved by Engineer.

C. Water.
1. Shall be clean, fresh, and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete reinforcement. Water shall contain less than 50 ppm of chlorides.

D. Admixtures: Furnish from one (1) Manufacturer. Apply uniformly to all concrete batches for any one pour.
1. Characteristics: Compatible with each other and free of chlorides or other corrosive chemicals. NSF 61 approved.
2. Air Entraining Admixture:
a. ASTM C260, nontoxic after thirty (30) days and contain no chlorides.
b. Concrete with air-entrainment admixture added shall maintain air percentage as batched, within the specified range for the time required for placement into structure.
3. Water-Reducing Admixtures: ASTM C494, Type A or Type D.
a. Manufacturers and Products:
1) BASF, Master Builders; Pozzolith or Polyheed.
2) W. R. Grace & Co; WRDA HYCOL.
3) Euclid Chemical Co; Eucon WR-91.
4. Superplasticizers:
a. ASTM C494.
b. Hold slump of four and one-half inches (4-1/2") or greater for time required for placement into structure with water-cement ratio.

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c. Furnish type as recommended by Manufacturer for allowed temperature ranges.
d. Type F or G.
e. Manufacturers and Products:
1) BASF, Master Builders; Rheobuild, Pozzolith, or Polyheed at dosage greater than ten (10) ounces per one hundred (100) pounds of cement.
2) W. R. Grace & Co.; Daracem 100.
3) Euclid Chemical Co.; Eucon or 537 G.
4) No "or-equal" or substitute products will be considered.

5. Pozzolan (Fly Ash): Class F fly ash in accordance with ASTM C618, Table 1 and 2, except as modified herein:

a. Loss on Ignition: Maximum three percent (3%).
b. Water Requirement: Maximum one hundred percent (100%) of control.
c. Available Alkalies: Maximum of one and one-half percent (1-1/2%) Na20 determined in accordance with ASTM C311 when any portion of aggregates are potentially reactive as defined in Appendix X1 of ASTM C33.
d. ASTM C618, Table 3, Effectiveness in Controlling Alkali-Silica Reaction, applies when any portion of aggregates are potentially reactive as defined in Appendix X1 of ASTM C33.
e. ASTM C618, Table 2A, Uniformity Requirements, apply when loss on ignition of fly ash furnished exceeds three percent (3%).
f. For fly ash not meeting the requirements of the chemical ratio listed in ASTM C618, furnish the following:
1) Test fly ash in accordance with ASTM C1012.
2) Furnish test data confirming fly ash in combination with cement used meets strength requirements, is compatible with air-entraining agents and other additives, and provides increased sulfate resistance equivalent to or better than Type II cement.
3) Conduct tests using proposed fly ash and cement samples together with control samples using Type II cement without fly ash.

6. Retarding Admixture: ASTM C494, Type B, non-chloride.

a. May be used to retard setting time to accommodate long haul distances.
b. Use in accordance with manufacturer's recommendations.
c. Approved products:
1) BASF, MasterSet Delvo.
2) Or equal.

7. Waterproofing:

a. Use NSF 61 certified integral waterproofing admixture in all concrete for the clearwell.
b. Approved products:
1) Xypex, C-500 by Xypex Chemical Corporation.

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2) Hycrete W502 by Hycrete, Inc.
3) Or approved equal.

2.2 CONCRETE PRODUCTION

A. Ready-mixed Concrete.
1. Mixed and delivered, ASTM C94.

B. Batching and Mixing Equipment.
1. Conform to, ACI 304.

C. Proportioning.
1. Proportion ingredients to produce a well-graded mix of high density and maximum workability consistent with approved mix design and subject to the following:
   a. Strength - Minimum twenty-eight (28) day compressive strength
      1) Four thousand five-hundred pounds per square inch (4,500 psi) for all structural concrete on the project.
      2) Three thousand (3,000) psi for manhole bases, thrust blocks, pipe encasements, curbs and gutters, and sidewalks.
   b. Fine/coarse aggregate ratio:
      1) Fine aggregate content: Forty percent to fifty percent (40% - 50%) by total weight of aggregate.
   c. Minimum cement content (or combined cement plus fly ash content):
      1) Five hundred sixty-four pounds (564 lbs) per cubic yard for 4500 psi concrete.
      2) Five hundred forty pounds (540 lbs) per cubic yard for other concrete.
2. Air Content.
   a. Six percent (6%) plus or minus (+/-) one percent (1%) for three-quarter-inch (3/4") or one-inch (1") coarse aggregate.
   b. Five percent (5%) plus or minus (+/-) one and one-half percent (1-1/2%) for one and one-half-inch (1-1/2") coarse aggregate.
3. Strength and water/cement ratios (or water/cement plus fly ash ratios).
   a. Design and proportion concrete to meet the following minimum compressive strengths and water to cement ratios:

Specified Strength, (psi)	7-Day Test (psi)	28-Day Test (psi)	W/C Ratio
4500	3150	4500	0.40
3000	2100	3000	0.46

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4. Slump Range at Site:

    a. Nonsuperplasticized Concrete: three inches (3") minimum, five inches (5") maximum.
    b. Superplasticized Concrete: four and one-half inches (4-1/2") minimum, eight inches (8") maximum.
    c. Take design mix test cylinders from concrete with slump equal to that used on Project at the point of discharge into the forms.

5. Mixing - Minimum time.

    a. Central-mixed concrete, one (1) minute for mixer capacities of one cubic yard (1 CY) or less, plus fifteen (15) seconds for each cubic yard, or fraction thereof, of additional capacity.
    b. Truck-mixed concrete, one hundred (100) revolutions after introduction of all ingredients.

6. Admixtures:

    a. Fly Ash: Use in all concrete unless otherwise approved by Engineer. Maximum twenty-five percent (25%), minimum fifteen percent (15%) of total weight of fly ash plus cement.
    b. Water Reducers: Use at Contractor's option.
    c. Superplasticizers: Use in all structural walls and beams. Use in other elements and slabs at Contractor's option. Control the slump and workability to at least a four and one-half inch (4-1/2") slump at discharge into forms by adjusting the superplasticizer at the batch plant.
    d. Waterproofing: Proportion integral waterproofing admixture in accordance with Manufacturer's requirements.

2.3 CONCRETE ACCESSORY MATERIALS

A. Curing Materials.
    1. Water.
    2. Sheet material:
        a. ASTM C171.
    3. Liquid membrane:
        a. ASTM C309.

B. Expansion Joint Filler.
    1. Bituminous type:
        a. ASTM D994.
    2. Cork type:
        a. ASTM D1752, Type 2 or 3.
    3. Fiber type:
        a. ASTM D1751.

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C. Bonding Agent.
   1. ASTM C1059, Type II, or ASTM C881, Type II.
   2. Furnish as recommended by Manufacturer for surface finish, pot life, set time, vertical or horizontal application, and forming restrictions.
      a. Master Builders Technologies.
      b. Sika Chemical Corp.
      c. Euclid Chemical Co.
      d. Or approved equal.

D. Bond Break Material.
   1. Felt:
      a. ASTM D2475.
      b. Polyethylene film material.

E. Joint Sealers.
   1. As specified in Section 03251 – Expansion, Construction, and Control Joints.

F. Water stop.
   1. As specified in Section 03251 – Expansion, Construction, and Control Joints.

G. Curing Compounds.
   1. Liquid membrane-forming: Pigmented and non-pigmented ASTM C309.
      a. W.R. Meadows 1100 Clear Series.
      b. Or approved equal.

H. Evaporation Retardant.
   1. Optional: Fluorescent color tint that disappears completely upon drying.
      a. CONFILM by Master Builders Co.
      b. Eucobar by Euclid Chemical Co.
      c. Or approved equal.

I. Resurfacing Coating.
   1. Blend of white and gray Portland Cement, dry polymers, and aggregates.
      a. 3-2-1 by US spec.
      b. Or approved equal.

J. Sealing Compounds.
   1. Floor surfaces:
      a. W.R. Meadows, VOCOMP-30.
      b. Or approved equal.
   2. Color:
      a. Clear.

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K. Crack Repair Epoxy.
   1. Two-component epoxy injection by Sika Chemical Corp., Lyndhurst, NJ.
   2. Or equal.

L. Leak Repair Injection Grout.
   1. SealBoss 1510.
   2. SealBoss 1570LV.
   3. Sikafix HH LV.
   4. Or approved equal.

M. Epoxy Anchors.
   1. Hilti HIT –RE-500-SD.
   2. Hilti HIT-HY 200.
   3. Simpson SET-XP
   4. Powers Fasteners, Inc., PE 1000+
   5. Or equal.

N. Polyethylene Film
   1. ASTM E1745, 10 mil.

PART 3 EXECUTION

3.1 INSPECTION

A. General.
   1. Assure that excavations and formwork are completed.
   2. Assure that dirt, mud, encrusted concrete, debris, and excess water have been removed.
   3. Check that reinforcement is properly positioned and secured in place.
   4. Verify that expansion joint material, anchors, water stops, and other embedded items are secured in proper position.
   5. Verify that all required tests for pipes under slabs have been completed.

3.2 PREPARATION

A. General.
   1. Remove any hardened concrete and foreign material from inner surface of conveying equipment.
   2. Prepare slab subgrades in accordance with ACI 301.
   3. Moisten subgrade before placement.

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a. Do not cause water to pond, become muddy, or cause soft spots to appear.

4. Designate limits of each placement and obtain Engineer's approval of entire installation before proceeding.

B. Concrete Placed Against Gravel or Crushed Stone.

1. Cover with polyethylene film all surfaces that do not contain at least twenty-five percent (25%) material passing a No. 4 sieve to protect concrete from loss of water.

2. Lap joints in film at least four inches (4").

C. Concrete Placed Against Rock.

1. Remove all loose pieces of rock.

2. Clean exposed rock surface with high-pressure hosing.

D. Concrete Bonding.

1. To new concrete:

a. New concrete is defined as less than sixty (60) days old.
b. Remove all laitance, foreign substances (including curing compound), roughen, wash with clean water, and thoroughly wet the existing or hardened surface before placing fresh concrete.
c. Limit concrete lift placed immediately above horizontal construction joint to twelve inches (12").

2. To old concrete:

a. Mechanically roughen the existing concrete surfaces to a clean, rough surface using a Blastrac, Porta-Shotblast, or other comparable blast cleaning equipment.
b. Coat contact surfaces with bonding agent as specified.
c. Apply bonding agent in accordance with manufacturer's instruction.

3.3 PLACEMENT

A. Conveying.

1. Convey concrete from mixer to final position as rapidly as practicable without segregation or loss of material.

2. Use only non-aluminum metal or metal-lined chutes with maximum length of twenty feet (20').

a. Maximum slope of one vertical to two horizontal (1V:2H).
b. Minimum slope of one vertical to three horizontal (1V:3H).

3. Provide a hopper at the end of long belt conveyors and chutes that do not meet the requirements in item 2 above.

4. Conveying by pumping methods shall conform to ACI 304, Chapter 9.

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a. Maximum loss of slump: Two inches (2”).
b. Do not pump concrete having a slump of less than two inches (2”).
c. Do not use aluminum or aluminum alloy pipe to convey concrete.

B. Depositing.
1. Deposit concrete in a continuous operation until section is completed.
2. Regulate rate of placement so concrete remains plastic and flows into position.
3. Place concrete in approximately horizontal layers of:
a. Eighteen inches (18”) maximum thickness for liquid containing structures.
b. Twenty-four inches (24”) for all other structures.
4. Each layer of concrete shall be plastic when covered with the following layer.
5. Rate of vertical rise should be in accordance with form manufacturer’s recommendation.
6. Provide vertical joints as necessary to comply with these requirements.
7. Maximum height of concrete free fall shall not exceed eight feet (8’).
8. Use a tremie for placing concrete in columns and walls to prevent free fall of more than eight feet (8’).
a. Do not allow concrete to fall on reinforcement or other objects that would cause segregation.
9. Tremies shall have varying lengths to limit free fall of concrete to not more than eight feet (8’) at all times.
10. Do not exceed six feet (6’) of vertical height for any portion of wall or column placed monolithically with floor or roof slab.
11. Concrete in walls or columns shall settle at least two (2) hours before concrete is placed in structural systems to be supported by such walls or columns.
12. Allow concrete to thoroughly settle before top is finished.
a. Remove all laitance, debris, and surplus water from surfaces at tops of forms by screeding, scraping, or other effective means.
13. Overfill forms wherever top of a wall will be exposed to weathering; and after concrete has settled, screed off excess.
14. Provide back-up bucket placement or have written confirmation of back-up pumper available.

C. Consolidation.
1. During and immediately after placement, thoroughly compact and work around all reinforcements, embedments, and corners of forms.
2. Use mechanical vibrators that will maintain at least nine thousand cycles per minute (9000 cpm) when immersed in concrete.
3. Minimum horsepower per vibrator shall be one and one-half horesepower (1-

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1/2 hp).

4. Number and type of vibrators shall be acceptable to Engineer.

5. Provide at least one standby vibrator in operable condition at placement site prior to placing concrete.

6. Do not use vibrators to transport concrete laterally in forms.

7. Vertically insert vibrators at points approximately eighteen inches (18") apart and to a depth to penetrate six inches (6") into the preceding layer.

8. Vibrate each location for a length of time to obtain adequate consolidation.

9. Do not cause segregation of materials by over-vibrating. Operate vibrators in order to avoid segregation of materials.

3.4 JOINTS

A. As specified in Section 03251 – Expansion, Construction, and Control Joints.

B. Watertight Joints.
   1. Provide on water bearing structures.
   2. Provide on structures submerged in ground water.
   3. At all locations shown on the Drawings.
   4. Walls and bottom slabs of dry pits or rooms below finished grade and in contact with backfill or subgrade material on the opposite side.
   5. Structures which are required to be tested for leakage by the specifications.

C. Expansion and Contraction Joints.
   1. At all locations shown on the Drawings.
   2. Do not extend reinforcement continuously through expansion joint unless specifically shown on the Drawings.
   3. Form joint with felt, ASTM D2475.
      a. Extend felt full depth, where "break bond" or "isolation" joint is indicated.
   4. Provide saw-cut contraction joints at locations shown on the drawings.

D. Construction Joints.
   1. Where shown on the Drawings.
   2. Obtain Engineer's concurrence for location of construction joints not shown on the Drawings.
   3. Locate joints as follows:
      a. Columns and walls.
         1) At underside of beams, girders, haunches, drop panels, column capitals, and at floor levels.

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2) All haunches, drop panels, and column capitals shall be considered as parts of supported floor or roof and shall be placed monolithically therewith.
3) Column bases will not be required to be monolithic with floor beneath.
4) Walls shall be divided into horizontal sections not to exceed forty feet (40'), except at corners which shall be as indicated on the drawings.
5) Walls shall be divided into vertical sections not to exceed twenty feet (20') unless otherwise approved by Engineer.

b. Beams and girders.
1) At middle third of span, except where a beam intersects a girder, in which case offset joint a distance equal to twice the width of the beam.
2) Provision satisfactory to the Engineer shall be made for transfer of shear and other forces through construction joint.

c. Suspended slabs.
1) At middle third of span in flat slab or T-beam construction.
2) No joint will be permitted between a slab and a concrete beam or girder unless specifically shown on the Drawings.
3) Each slab shall be divided into approximately square sections not to exceed forty feet (40') in their longest dimension.

d. Pan-formed joists.
1) At or near center of span when perpendicular to joists.
2) Centered in slab, midway between joists, when parallel to joists.

e. Construction joints in beams, girders, and slabs shall be perpendicular to planes of their surfaces.

f. Bottom slabs on grade.
1) Each bottom slab shall be divided into approximately square sections not to exceed forty feet (40') in their longest dimension.

4. No two abutting sections shall be placed within a period of seven (7) days, unless otherwise authorized by the Engineer.

3.5 EMBEDDED ITEMS

A. Refer to Section 03100 – Concrete Formwork.

3.6 FINISHING UNFORMED SURFACES

A. Finish unformed surfaces as specified herein unless shown on the Finish Schedule at the end of this Section.

B. Slabs, floors, stairs, pavements, sidewalks, driveways, curb and gutters, and similar structures.
1. Provide surface conforming to proper elevation and contour with all aggregates completely embedded in paste by screeding.

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a. Screeded surfaces shall be free of surface irregularities.
b. Maximum variation from level (or specified slope) in any ten-foot (10') section, plus or minus (+/-) one-quarter inch (1/4").
c. Basin floors.
1) Accurately finish basin floors that do not require separate topping to a uniform slope.
2) Floors shall be within one-half inch (1/2") of shape indicated on the Drawings.

2. Provide an initial float finish as soon as concrete has stiffened sufficiently for proper working.

a. Remove any piece of coarse aggregate which is disturbed by float or which causes a surface irregularity and replace with paste.
b. Produce a surface of uniform texture and appearance with initial floating, without unnecessary working of surface.

3. Provide a second floating at time of initial set.

a. Produce a finish of uniform texture and color with second floating.
b. Float finish produced by second floating shall be completed finish unless additional finishing is specifically required and specified.
c. Perform floating with hand floats or suitable mechanical compactor-floats.

C. Brooming.

1. Follow second floating with a broomed treatment of surface to provide a uniform abrasive texture of constant color, in exterior areas where concrete is to remain exposed.

a. Broom exterior concrete stairs, sidewalks, driveways, curb and gutters, pavement replacement, and exterior decks or slabs.
b. Broom at right angles to normal traffic direction.

D. Troweling.

1. Steel trowel finish following surfaces:

a. Exposed interior floor surfaces after construction is completed.
b. Surfaces to be covered with resilient floor covering or thin-set terrazzo.
c. Exposed portion of top of equipment bases.
d. Top of interior curbs.
e. Other surfaces that may be designated on the Drawings.
f. Steel trowel finish will not be required for slabs normally submerged.

2. Perform steel troweling after second floating when surface has hardened sufficiently to prevent excess of fines being drawn to surface.

a. Produce a dense, smooth, uniform surface free from blemishes and trowel marks.
b. Power trowel surface to smooth finish with a tolerance of plus or minus one-quarter inch (±1/4") in ten feet (10').
c. Hand trowel areas inaccessible to power trowel.

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E. Finishing Surfaces for Bonding to be Covered with Concrete Topping.
   1. Float finish all surfaces.
   2. Remove by brushing, or air blasting at time of initial set, all laitance, surface paste, and unsound material.
   3. Surfaces shall be rough, clean, and sound.

F. Edging.
   1. Edge exposed edges of floated or troweled surfaces with a tool having a one-quarter inch (1/4") corner radius unless these edges are specified to be chamfered.

G. Floor sealer where called out on the Drawings or shown in the Finish Schedule at the end of this Section.
   1. Apply in strict accordance with manufacturer's recommendations.

3.7 FINISHING FORMED SURFACES

A. Finish formed surfaces as specified herein unless shown in the Finish Schedule at the end of this Section.

B. Finishing.
   1. Rough form finish all surfaces not exposed to view such as surfaces in contact with earth.
      a. Remove all fins and other surface projections when damp proofing is specified.
      b. Provide a flush surface and use a power grinder, if necessary, to remove fins and projections.
      c. Fill all tie holes with patching mortar.
   2. Smooth form finish all exposed surfaces not generally exposed to view including submerged surfaces of tanks.
      a. Use form facing to produce a smooth, hard, uniform surface.
      b. Keep number of seams to a minimum.
      c. Remove all fins and projections.
      d. Clean, wet, and fill all tie holes with patching mortar.
      e. Repair and patch all defects.
   3. Grout clean finish (sack rub) all concrete surfaces exposed to view, including tank walls above the normal water level.
      a. Complete operations for smooth form finish.
      b. Wet surface and apply grout mix of one (1) part of Portland Cement and one and one-half (1-1/2) parts of fine sand or resurfacing coating product. Use bonding agents as necessary to ensure grout adherence.
      c. Substitute white Portland Cement for gray as required to match surrounding concrete.
      d. Rub surface with cork float or stone to fill all air bubbles and holes.

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e. Remove excess grout by rubbing with a rubber float, burlap bag, or other means.

f. Do not begin cleaning until all contiguous surfaces are completed and accessible.

3.8 CURING

A. Water Cure for Slabs.

1. Keep concrete continuously saturated with water for at least seven (7) days after placement by use of:

   a. Ponding, continuous sprinkling, wet burlap, or wet absorptive mats.
      1) Begin as quickly as possible after initial set.
      2) Provide complete coverage with minimum of runoff by regulating rate of water application.

   b. In cold-weather concreting, use membrane curing compound in lieu of water curing.

B. Membrane Curing Compound.

1. Use on slabs only with Engineer's written approval.

2. Spray apply at double the coverage as recommended by manufacturer.

3. Apply curing compound immediately to formed surfaces.

4. Protect compound against abrasion during the curing period.

5. Membrane curing compound shall be reapplied each day after any work activity has occurred on concrete surface.

6. For concrete surfaces to be painted or top coated, neutralize and remove curing compound after curing period.

C. Film Curing.

1. Use only with Engineer's concurrence on a pour-by-pour basis.

2. If allowed by Engineer, film curing with polyethylene sheeting shall be used instead of water curing on concrete which will be covered later with mortar or additional concrete or will otherwise be covered or hidden from view.

3. Begin as quickly as possible after initial set of concrete.

4. Cover surfaces completely with polyethylene sheeting.

5. Overlap edges for proper sealing and anchorage.

6. Seal joints between sheets.

7. Promptly repair all tears, holes, and other damage.

8. Anchor continuously all edges and anchor surface as necessary to prevent billowing.

9. Keep concrete continuously wet during curing period.

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3.9 PATCHING TIE HOLES

A. Fill with Category I or II grout as specified in Section 03600 - Grout, except where sealant is shown. Use only enough water to dry pack.

B. Match color of adjacent concrete by adding Portland cement or fine aggregate.

C. Avoid smearing grout on concrete wall surfaces around tie holes.

D. Compact grout using steel hammer and steel tool to drive grout to high density.

E. Cure grout with water.

3.10 REPAIR AND REPLACEMENT OF DEFECTIVE CONCRETE

A. Repair within twenty-four (24) hours, after removal of forms, all defects in concrete surfaces.
   1. The Contractor shall submit repair materials and procedures.
   2. The final surface shall be acceptable to the Engineer in appearance.

B. Replace, under the concurrence of the Engineer, all defective concrete.
   1. Removal and replacement of concrete shall be performed by a plan submitted by the Contractor and approved by the Engineer.
   2. This work shall meet the tolerance and finish specified in this Section.
   3. The final surface shall be acceptable to the Engineer in appearance.

C. Remove defective concrete such as honeycombed areas, rock pockets, popouts, staining, and other defects out to sound concrete.

D. If chipping is required, make edges perpendicular to the surface with a minimum depth of one-quarter inch (1/4”). Do not feather edges.

E. Repair work shall conform to ACI 301 and ACI 546.

F. Perform in a manner that will not interfere with thorough curing of surrounding concrete.

G. Adequately cure all repair work.

H. Small shallow holes caused by air entrapment at surface of forms shall not be considered defects unless amount is so great as to be considered not the standard of the industry and due primarily to poor workmanship.

I. All leaking cracks in liquid holding structures are to be repaired by the epoxy injection method. The work shall be done by a certified applicator of the epoxy manufacturer. A liquid holding structure shall be one that contains liquid or one that is to prevent liquids from penetrating to a dry area.

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3.11 BACKFILL

A. Do not backfill walls until field-cured concrete cylinders have obtained twenty eight (28)-day compressive strength.

B. Do not backfill structures with top slabs until top slab field-cured concrete cylinders reach seven (7) day compressive strength unless approved in writing by the Engineer.

C. Place backfill uniformly around structures to prevent differential pressures and sliding. Where backfill is required on both sides of walls, backfill both sides simultaneously so that the difference in backfill grade elevation does not exceed one foot (1').

3.12 QUALITY CONTROL

A. Concrete Tests.

1. Concrete tests shall be in accordance with the requirements of ACI 301, Section 1.6 – Quality Assurance except as noted or modified in this Section.

    a. Strength test.

        1) Mold and cure four (4) 6-inch by 12-inch cylinders or five (5) 4-inch by 8-inch cylinders from each sample.
        2) Test one (1) at seven (7) days for information, two (2) 6-inch by 12-inch cylinders or three (3) 4-inch by 8-inch cylinders at twenty-eight (28) days for acceptance, and one (1) to hold for a future break.
        3) If additional cylinders are required for Contractor's information, said cylinders will be in addition to those listed above.

    b. Minimum samples.

        1) Collect the following minimum samples for each twenty eight (28) day strength concrete used in the Work for each days placing:

Quantity	Number of Samples
50 cubic yards or less	One
50 to 100 cubic yards	Two
100 cubic yards or more	Two plus one sample for each additional 100 cubic yards

    c. Sample marking.

        1) Mark or tag each sample of compression test cylinders with date and time of day cylinders were made.
        2) Identify location in Work where concrete represented by cylinders was placed.
        3) Identify delivery truck or batch number, air content, and slump.

    d. Slump test.

        1) Conduct test for each batch.

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e. Air content.
   1) Conduct test for each batch.

f. For beams, slabs, and similar sections, determine strength from job-cured cylinder breaks. Cylinders are to be job-cured in the same manner as the formed concrete. Forms of elevated slabs and beams shall not be removed prior to Engineer approval of 7-day job-cured concrete compressive strength test results.

g. Pumped concrete: At the start of pumping each day and at the Engineer's discretion, concrete will be sampled from the concrete truck and the pump to determine slump and air content losses through the pump. If the concrete air content is more than one-half percent (1/2%) out of the specified range or the slump is more than one inch (1") out of the specified range at the end of the pump, the Contractor shall make adjustment to the concrete and pumping methods to bring concrete within the specified range at the point of discharge into the forms.

B. Acceptance of Concrete.

1. Strength level of concrete will be considered satisfactory so long as average of all sets of three (3) consecutive strength test results equals or exceeds specified twenty-eight (28) day strength and no individual strength test result falls below specified strength by more than five hundred pounds per square inch (500 psi).

C. Failures of Test Cylinder Results.

1. Upon failure of test cylinder results, Engineer may require Contractor, at his expense, to obtain a test of at least three (3) two-inch (2") diameter cored samples from the area(s) in question.

2. Results of core tests will be evaluated by Structural Design Engineer for determination of acceptance or failure of the test cylinders.

3. Upon failure of core test results, Engineer may require Contractor, at his expense, to perform load tests as specified in ACI 318, or remove and replace the defective concrete at Contractor's expense.

4. Fill all core holes as specified for repairing defective concrete.

D. Leak Tests.

1. Do not leak test walls until field-cured concrete cylinders have obtained twenty eight (28)-day compressive strength.

2. Do not leak test structures with top slabs until top slab field-cured concrete cylinders have obtained twenty eight (28)-day compressive strength.

3. Test liquid: Clean water.

4. Purpose: Assess structural integrity of walls, determine water-tightness of structure, and visual acceptability of exposed walls.

5. Test Preparation:

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a. Perform leakage tests after concrete has reached its design strength and before backfilling or other work that will cover the wall surfaces.
b. Provide watertight seals at all penetrations including pipes or gates.
c. Fill structure with water to the maximum liquid level prior to conducting the test. Maintain this level for 72 hours prior to testing.

6. Test.

a. Fill the tank to at least the design high water level.
b. Measure the water level at the beginning and end of the 24 hour period to determine water volume loss during the test period.
c. Determine evaporation by floating an evaporation pan in the structure during the test period.
d. Determine precipitation by a rain gage placed at the test location.
e. Visually examine all exterior walls and slabs to determine evidence of dampness or leaks.
f. Mark all damp spots and leaks.

7. Acceptance criteria. The following criteria must be met to pass the test.

a. Volume loss of less than 0.01 percent of the initial volume, after accounting for evaporation and precipitation.
b. No evidence of damp areas or seepage.

8. Repair.

a. Drain the structure.
b. Repair all marked spots or leaks by epoxy injection or other approved method.

9. Retest: Repeat items 3-6 above until the acceptance criteria are met.

3.13 CONCRETE FINISHES

A. Cleaning: Final surface of slabs and walls exposed to view shall be clean and uniform. Discoloration caused by oil, grease, or other surface contaminants shall be cleaned and removed by Contractor.

B. Sealers.

1. Surfaces shall be clean of all contaminants, and staining prior to applying sealer.

2. Prepare surfaces and apply sealers in accordance with manufacturer's recommendations.

C. Utilize the following finishes unless noted otherwise on the drawings.

FINISH SCHEDULE		
Surface	**Sealer**	**Finish**
Formed Walls Exposed to View	No	Sack Rub
Tank Slabs	No	Non-Slip/Float
Vault Floor Slab	No	Non-Slip/Float
Exterior Slabs and Walkways	No	Light Broom

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3.14 DISINFECTION

A. Disinfection for Water Storage Facilities:
   1. Conform with AWWA C652.

END OF SECTION

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SECTION 03600 – GROUT

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers sand-cement grout, cementitious, non-shrink grout, epoxy non-shrink grout, epoxy-bonding agent, and where each is to be used.

B. Grouting is required for the following items as applicable:
   1. Pump, motor, and equipment baseplates, pedestals, or bedplates.
   2. Column baseplates.
   3. Motor control center bases.
   4. Other miscellaneous baseplates.
   5. Anchor bolts.
   6. Watertight structures.
      a. Where walls join tank bottoms or hardened concrete floors.
   7. Openings in cast-in-place or pre-cast concrete sections where:
      a. Cast-in-place walls are constructed around openings.
   8. Open or closed channel fillets.
   9. Fillets required for equipment installed.
   10. Structural floors when called for on the Drawings.
   11. Other grout uses as shown or called for on the Drawings.

C. Inform Engineer at least forty-eight hours (48 hrs.) in advance of time and places at which Contractor intends to place grout.

1.2 QUALITY ASSURANCE

A. Perform all work in accordance with the latest revisions of the following codes and standards.
   1. Federal, state, and local codes, regulations, and ordinances.
   2. American Concrete Institute (ACI).
   3. American Society for Testing and Materials (ASTM).
   4. Portland Cement Association (PCA).
   5. American National Standard Institute (ANSI).
   6. Reference standards as applicable from Section 03300 – Cast-In-Place Concrete, paragraph 1.2.

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B. In case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself the more stringent condition, as determined by the Engineer, shall govern.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Product data on grouts.
   2. Sequencing schedule and curing methods for grout topping.
   3. Proposed method for keeping existing concrete surfaces wet prior to placing grout.

B. Quality Control Submittals:
   1. Manufacturer's written instructions for the mixing of grout.
   2. Manufacturer's Certificate of Compliance:
      a. Grout free from chlorides and other corrosion-causing chemicals.
      b. Nonshrink grout properties of Categories II and III, verifying expansion at three or fourteen (3 or 14) days will not exceed the twenty-eight (28) day expansion and nonshrink properties are not based on gas or gypsum expansion.

C. Proposed Mix Design (Sand-Cement Grout).
   1. Before commencing grout work, obtain and submit Engineer's recommendation for the proposed grout mix design.
   2. Submittal shall include:
      a. Fine aggregate: Source, type, and certification as complying with ASTM C33.
      b. Coarse aggregate: Source, type, and certification as complying with ASTM C33.
      c. Ratio of fine to total aggregates.
      d. Weight (surface dry) of each aggregate per cubic yard.
      e. Total water content in gallons per cubic yard and proposed source.
      f. Slump on which design is based.
      g. Brand, type, and quantity of cement.
      h. Brand, type, and quantity of admixtures.
      i. Air content.
      j. Reactive aggregate test reports. (ASTM C1260, C1293, or other test approved by Engineer).

D. Cylinder Compression Test Reports.
   1. Submit copies of certified test reports for each mix design to Engineer.

E. ANSI/NSF 61 Standard 61 Certification.
   1. For potable water holding structures, submit evidence that all construction

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materials used in the concrete have been certified under ANSI/NSF 61 or that they meet a standard consistent with ANSI/NSF 61 as approved by the New Mexico Environment Department.

1.4 GUARANTEE

A. Manufacturer's guarantee shall not contain disclaimer on the product data sheet, grout bag, or container limiting responsibility to only the purchase price of products and materials furnished.

B. Manufacturer guarantees participation with Contractor in replacing or repairing grout found defective due to faulty materials, as determined by industry standard test methods.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Store cement, admixtures, and grout products in weathertight enclosures and protect against dampness, contamination, and warehouse set.
   1. Do not use products that have become caked, lumpy, or contaminated.

B. Stockpile aggregates to prevent excessive segregation or contamination with other sizes of aggregates.
   1. Do not use aggregates that have been contaminated in any way.

C. Deliver packaged materials to the job site in original, unopened packages, clearly labeled with the Manufacturer's identification and printed instructions.

PART 2 PRODUCTS

2.1 SAND-CEMENT GROUT

A. Sand-Cement Grout, two inches (2") or more in thickness.
   1. Portland cement: ASTM C150, Type II.
      a. Type IIA, sulfate resistant, shall be required for applications in corrosive environments.
   2. Fine aggregate: ASTM C33, clean, well-graded sand.
   3. Coarse aggregate: ASTM C33, size 7.
   4. Ratio of fine and coarse aggregate: Fifty percent (50%) of each by volume.
   5. Water: Clean and free from deleterious substances.
   6. Slump: Four-inch (4") maximum.
   7. Water/cement ratio (W/C): 0.48 maximum.
   8. Air content: Six percent (6%) plus or minus one and one-half percent (±1½%).
   9. Compressive strength: Minimum 3,000 psi at twenty-eight (28) days.

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B. Sand-Cement Grout, less than two inches (2") in thickness.
   1. Portland cement: ASTM C150, Type II.
      a. Type IIA, sulfate resistant, shall be required for applications in corrosive environments.
   2. Fine aggregate: ASTM C33, clean, well-graded sand.
   3. Water: Clean and free from deleterious substances.
   4. Slump: Four-inch (4") maximum.
   5. Water/cement ratio (W/C): 0.48 maximum.
   6. Air content: Six percent (6%) plus or minus one and one-half percent (±1-1/2%).
   7. Compressive strength: Minimum 3,000 psi at twenty-eight (28) days.

2.2 NONSHRINK GROUT

A. Furnish nonshrink grout for applications in grout category in the following schedule:

Application	Temperature Range	Max. Placing Time	
	40 to 100° F	20 min	Greater than 20 min
Filling tie holes	I	I	I
Blockouts for gate guides	I or II		II
Column baseplates single-story	I or II		II
Machine bases 25 hp or less	II	II	II
Baseplates for columns over one story	II	II	II
Through-bolt openings	II	II	II
Patching concrete walls	II	II	II
Machine bases 26 hp and up	III	III	III
Baseplates and/or soleplates with vibration, thermal movement, etc.	III	III	III

B. Category I:
   1. Nonmetallic and nongas-liberating flowable fluid.
   2. Prepackaged natural aggregate grout requiring only the addition of water.
   3. Test in accordance with ASTM C1107:
      a. Flowable consistency one hundred forty percent (140%), five (5) drops in thirty (30) seconds, in accordance with ASTM C230.
      b. Flowable for fifteen (15) minutes.
   4. Grout shall not bleed at maximum allowed water.

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5. Minimum strength of grout, 3,000 psi at three (3) days, 5,000 psi at seven (7) days, and 7,000 psi at twenty-eight (28) days.

6. Manufacturers and Products:

    a. Master Builders Co., Cleveland, OH; Set Grout.
    b. Euclid Chemical Co., Cleveland, OH; NS Grout.
    c. Dayton Superior Corp., Miamisburg, OH; Sure-Grip High Performance Grout.

C. Category II:

1. Nonmetallic, nongas-liberating flowable fluid.

2. Prepackaged natural aggregate grout requiring only the addition of water.

3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.

4. Test in accordance with CRD-C621-83 and ASTM C1107, Grade B:

    a. Fluid consistency twenty to thirty (20 to 30) seconds in accordance with CRD-C611-81.
    b. Temperatures of forty, eighty, and one hundred degrees Fahrenheit (40° F., 80° F., and 100° F.).

5. One (1) hour after mixing, pass fluid grout through flow cone with continuous flow.

6. Minimum strength of grout, 2,500 psi at one (1) day, 4,500 psi at three (3) days, and 7,000 psi at twenty-eight (28) days.

7. Maintain fluid consistency when mixed in one to nine yard (1 to 9 yd.) loads in ready-mix truck.

8. Manufacturers and Products:

    a. Master Builders, Co., Cleveland, OH; Master Flow 928.
    b. Five Star products Inc., Fairfield, CT; Five Star 100.
    c. Euclid Chemical Co., Cleveland, OH; Hi Flow Grout.

D. Category III:

1. Metallic and nongas-liberating flowable fluid.

2. Prepackaged aggregate grout requiring only the addition of water.

3. Aggregate shall show no segregation or settlement at fluid consistency at specified times or temperatures.

4. Test in accordance with CRD-C621-83 and ASTM C1107, Grade B:

    a. Fluid consistency twenty to thirty (20 to 30) seconds in accordance with CRD-C611-81.
    b. Temperatures of forty and one hundred degrees Fahrenheit (40° and 100°F.).

5. One (1) hour after mixing, pass fluid grout through flow cone with continuous

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flow.

6. Minimum strength of grout, 4,000 psi at one (1) day, 5,000 psi at three (3) days, and 9,000 psi at twenty-eight (28) days.

7. Maintain fluid consistency when mixed in one to nine yard (1 to 9 yd.) loads in ready-mix truck.

8. Manufacturers and Products: Master Builders, Co., Cleveland, OH; EMBECO 885.

9. Non-shrink, epoxy grout as specified in 2.03 may be used in place of Category III non-shrink grout.

2.3 NON-SHRINK, EPOXY GROUT

A. Non-shrink epoxy grout shall be a one hundred percent (100%) solids, pre-measured, pre-packaged system containing thermo-setting epoxy resins and inert fillers and not containing any non-reactive dilutents.

B. Material shall meet the following minimum performance requirements:
   1. Volume change: ASTM C827 (modified).
      a. No shrinkage (0.0%) and a maximum two percent (2.0%) expansion from time of placement.
   2. Compressive strength: ASTM C579.
      a. Minimum seven-day compressive strength of 16,000 psi.
   3. Thermal expansion: ASTM C531.
      a. Maximum coefficient of thermal expansion of 30x10-6 in./in./°F.
   4. Creep resistance: ASTM C1181.
      a. Creep equal to or less than 5.0x10-3 in./in. at 180°F for one (1) year with a load of 400 psi.
   5. Placeability: Grout shall be capable of maintaining at least a flowable consistency for a minimum of thirty (30) minutes at seventy degrees Fahrenheit (70° F.).

C. Manufacturers.
   1. Five Star Products, Inc.: Five Star DP Epoxy Grout.
   2. Or approved equal.

2.4 EPOXY BONDING AGENT

A. Epoxy bonding agent shall be a multi-purpose, two-component, one hundred percent (100%) solids, moisture-insensitive structural epoxy adhesive.

B. Bonding agent shall meet the following minimum performance requirements:
   1. Conform to current ASTM C881.
   2. Pot life: Approximately thirty (30) minutes.

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3. Tensile properties: ASTM D790.

   a. Seven-day (7-day) tensile strength: 5,100 psi.

4. Flexural properties: ASTM D790.

   a. Fourteen-day (14-day) flexural strength: 7,400 psi.

5. Shear properties: ASTM D732.

   a. Fourteen-day (14-day) shear strength: 5,900 psi.

6. Bond strength: ASTM C882.

   a. Fourteen-day (14-day) cure: 2,400 psi.

7. Compressive properties: ASTM D695.

   a. Twenty-eight-day (28-day) compressive strength: 10,300 psi at seventy-three degrees Fahrenheit (73° F.).

2.5 ACRYLIC BONDING AGENT

A. High strength, emulsified, integral bonding agent.
   1. ASTM 1059, Type II: Non-reemulsifiable after cure.

B. Bonded assemblies shall be unaffected by water.

C. Unaffected by freeze-thaw cycles after application.

D. Shall not contain VOC.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Roughen all concrete surfaces by sandblasting or other mechanical means to assure bond.

B. Loose or broken concrete shall be removed.

C. Completely remove all grease, oil, dirt, curing compounds, laitance, and other deleterious materials from concrete and bottom of baseplates.

D. Saturate concrete surfaces for twenty-four (24) hours before grout placement.

E. Remove all standing water just before grout placement.

F. Heat surfaces in contact with grout to a minimum of fifty degrees Fahrenheit (50° F.) for twenty-four (24) hours before grout placement.

G. Grout temperature, at time of placement, shall be between fifty degrees Fahrenheit and sixty-five degrees Fahrenheit (50° F. and 65° F.), or as recommended in Manufacturer's literature.

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H. Contractor shall submit detailed installation procedures and receive Engineer's recommendation before grout installation.

3.2 MIXING AND PLACING

A. Sand-Cement Grout, two inches (2") or more in thickness.
   1. Contractor shall provide grout in accordance with approved mix design.
   2. For projects with less than three-quarter yard (3/4 yd.) of grout, the following proportions shall apply:
      a. Mix: One (1) part Portland cement, two and one-half (2-1/2) parts of aggregate (50% fine and 50% coarse) by volume with sufficient water for placement and hydration.
   3. Mix grout in a mechanical mixer.
   4. Use as little water as possible for steep grout fillets.
   5. Saturate concrete to receive grout with clean water for twenty-four (24) hours before grouting.

B. Sand-Cement Grout, less than two inches (2") in thickness.
   1. Contractor shall provide grout in accordance with approved mix design.
   2. For projects with less than three-quarter yard (3/4 yd.) of grout, the following proportions shall apply:
      a. Mix: One (1) part Portland cement, two and one-half (2-1/2) parts of fine aggregate by volume with sufficient water for placement and hydration.
   3. Mix grout in a mechanical mixer.
   4. Use no more water than is necessary to produce a flowable grout.
   5. Saturate concrete to receive grout with clean water for twenty-four (24) hours before grouting.

C. Non-Shrink Grouts.
   1. Mix and place in strict accordance with directions and instructions of Manufacturer.
   2. Fill spaces and cavities below top of baseplates, bedplates, column baseplates, and other areas requiring grouting.
   3. Leave no voids.
   4. Provide forms where structural components of baseplates or bedplates will not confine grout.

D. Epoxy Grout, Epoxy Bonding Agent, and Acrylic Bonding Agent.
   1. Mix and place in strict accordance with recommendations and instructions of Manufacturer.

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3.3 FINISHING

A. Edge Finishing.
   1. Finish smooth edges exposed to view after grout has reached initial set.
   2. Bevel edges from baseplate, bedplate, or piece of equipment to supporting concrete at a slope ranging from one vertical to one horizontal (1V:1H) to two vertical to one horizontal (2V:1H).

3.4 CURING

A. Sand-Cement Grout.
   1. After the grout has achieved initial set, cover grout with a minimum of six inches (6") of water.
   2. Maintain water cure for a minimum of seven (7) days.
   3. Maintain temperature of grout above fifty degrees Fahrenheit (50° F.) for a minimum of seven (7) days.

B. Other Grouts.
   1. Cure in strict accordance with Manufacturer's recommendations.

3.5 LOCATIONS OF USE

A. Where type of grout is not designated on the Drawings, the following shall apply:
   1. Sand-cement grout as listed in 2.1.A. or B.
      a. Motor control center bases if not poured before motor control centers being in final location.
      b. Openings in cast-in-place or pre-cast concrete sections when short cast-in-place walls or curbs are constructed around openings.
      c. Open or closed channel fillets.
      d. Similar fillets before, after, or within certain equipment pieces.
      e. Other grout locations called for in the specifications and on the Drawings and where cementitious, non-shrink, or epoxy grout is not necessary.
   2. Epoxy grout.
      a. Use when setting anchor bolts or reinforcing rods into existing hardened concrete.
   3. Epoxy bonding agent.
      a. Use when pouring fresh concrete against existing hardened concrete where shown on the Drawings.
   4. Acrylic bonding agent.
      a. Use when pouring fresh concrete against existing hardened concrete at specified locations not requiring epoxy-bonding agent.

END OF SECTION

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SECTION 05500 – METAL FABRICATIONS

PART 1 GENERAL

1.1 DESCRIPTION

A. This Section covers items fabricated from metal shapes, plates, sheets, pipe, or cast metal except component parts of equipment.

B. Related Work Specified Elsewhere.
   1. Section 05999 – Miscellaneous Metals.

1.2 QUALITY ASSURANCE

A. Perform all work as specified herein and in accordance with the latest revisions of referenced codes and standards from the following organizations:
   1. Federal, State, and Local codes, regulations, and ordinances.
   2. American National Standard Institute, ANSI.
   3. American Society for Testing and Materials, ASTM.
   4. American Iron and Steel Institute, AISI.
   5. Aluminum Association, AA.
   6. American Institute of Steel Construction, AISC.
      a. Steel Construction Manual.
      b. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings.
      c. Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
   7. American Welding Society, AWS.
   8. National Association of Architectural Metal Manufacturers, NAAMM.
   9. International Code Council, ICC.

B. Welding procedures, welders, and welding operations shall be qualified and certified in accordance with the American Welding Society (AWS).
   1. Maintain welder's certification on file at site.
   2. Certification or re-certification shall be within six (6) months before commencing any welding operations.

C. All work shall conform to the 2009 International Building Code, IBC.

D. In case of conflict or disagreement between codes, standards, laws, ordinances, rules and regulations, or within any document itself, the more stringent condition shall govern.

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1.3 SUBMITTALS

A. Submit Shop Drawings and Operation and Maintenance Manuals.
   1. Include the following additional items.
      a. Shop coating manufacturer, products and dry film thickness.
      b. Include proper identification of all welds.
      c. Complete information regarding location, type, size, and length of field welds in accordance with "Standard Welding Symbols," A2.4. of the American Welding Society.

B. Before shipment, submit inspection and test reports on welding and high-strength bolted connections.

C. Submit sample of aluminum railing bend, connectors, and finish to Engineer and Owner for approval.

D. Submit details for monorail beam support loads, connection locations and splice locations.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery.
   1. Deliver embedded items in time to permit installation prior to placing concrete.
   2. Wrap aluminum railings prior to shipment.
   3. Prepare all items to avoid damage in transit.

B. Handling.
   1. Protect against bending.
   2. Protect shop coating.
   3. Use suitable equipment.

C. Storage.
   1. Place on blocks, above ground or water.
   2. Support to prevent bending.
   3. Prevent collection of water in items.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal

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fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for Work of another Section. Deliver such items to Project in time for installation.

PART 2 PRODUCTS

2.1 GENERAL

A. Workmanship:
1. Use materials of the size and thickness shown, or if not shown, of the required size and thickness to produce adequate strength and durability of the finished product for the intended use. Work to the dimensions of fabrication and support. Use type of materials shown or specified for various components of Work.
2. Form exposed Work true to line and level with accurate angles, surfaces, and straight sharp edges. Ease exposed edges to a radius of approximately one thirty-seconds of an inch (1/32") unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
3. Weld corners and seam continuously and in accordance with the recommendations of AWS. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.
4. Provide for anchorage of type shown, coordinated with supporting structure and the progress schedule. Fabricate as required to provide adequate support for the intended use of the Work.
5. Cut, reinforce, drill, and tap Miscellaneous Metal Work as may be required to receive finish hardware and similar items of Work.

B. Thermal Movement: Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): one hundred twenty degrees Fahrenheit (120°

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F.), ambient; one hundred eighty degrees Fahrenheit (180° F.), material surfaces.

C. Bolts, Anchor Bolts, and Expansion Anchors to be suitable for the service conditions.
   1. Use zinc or cadmium-plated fasteners where buried, immersed in saturated air, or in splash zone.
   2. Use hot-dip galvanized and stainless steel fasteners where noted on Drawings and where specified with items to be fastened.
   3. Use unfinished bolts in all other locations.
   4. Use self-locking nuts or lock washers on all bolts.
   5. Use stainless steel bolts on aluminum fabrications.
   6. Use isolation washers between all dissimilar metals.

D. Refer to 05999 – Miscellaneous Metals for material specifications.

2.2 ACCESS DOORS AND HATCHES

A. Floor Access Doors.
   1. Type, Size, and Location:
      a. Thirty-six inch by thirty-six inch (36” x 36”) single-leaf, factory fabricated, and completely assembled drained aluminum access door rated for 300 psf (min) loading.
         1) Location and Quantity:
            a) Tank top slab, two (2).
            b) Vault top slab, two (2).
         2) Manufacturer and model:
            a) Bilco, Model J-4AL.
            b) Halliday Products, Model W1S.
            c) Or equal.
            d) Or equal.
         3) Accessories
            a) Recessed lock box.
   2. Installation: Install in accordance with manufacturer’s requirements to achieve water tight seal.

2.3 WALL LADDER

A. Provide wall ladders with extension posts at the locations of all access doors and hatches.

B. Wall ladders may be shop fabricated or commercially purchased.

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C. Without exception, ladder shall comply with the minimum requirements listed in the latest revisions of OSHA 29 CFR Part 1910, Occupational Safety and Health Standards, General Industry Standards.

D. Ladder shall be detailed and submitted for review prior to fabrication or purchase.
   1. Show complete dimensions, attachments, hardware, materials, and construction.

E. Materials and Construction.
   1. All components shall be aluminum alloy 6061-T6.
      a. Ladder side rails: Flat shape, minimum two-inch by three-eighths inch (2" x 3/8") spaced at not less than sixteen inches (16") between rails.
      b. Rungs: Nonskid, round, square or D-shape, minimum three-quarter inch (3/4") spaced at twelve inches (12") center to center.
   2. All anchoring hardware shall be Type 316 Stainless Steel.
   3. At Engineer's sole discretion, alternate materials of construction may be considered as an "or equal" provided that the alternate materials satisfy all requirements that are applicable to the ladder assembly.
   4. Assembly shall be full weld construction and shipped to site complete and ready for installation.
   5. All welds shall be ground smooth.
   6. Provide protection for dissimilar metals and concrete.
   7. Manufacturers and Products: Halliday Products Series L1D or equal.

F. Accessories.
   1. Safety devices – Reference Section 05515 – Ladder Safety Devices.
   2. Extension Post.
      a. Manufacturers and Products: Halliday Products Series L1E, or equal.

2.4 GRATING

A. Materials.
   1. Aluminum Grating:
      a. Bearing bars: ASTM B221 shall be either alloy 6061-T6 or alloy 6063-T6, conforming to ASTM B221. Cross bars and bent connecting bars shall be of alloy 6061-T6 or 6063-T6 conforming to ASTM B221 or alloy 3003 conforming to ASTM B210.

B. Verify dimensions on site prior to shop fabrication.

C. Fabricate items with joints neatly fitted and properly secured. Fit and shop-assemble in largest practical sections for delivery to the site.

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D. Grind exposed welds smooth and flush with adjacent finished surfaces.
   1. All welds exposed to view to be "Architectural Grade."

E. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified.

F. Thoroughly clean surfaces of rust, scale, grease, and foreign matter prior to prime painting.

G. Prime paint items for field finishing as specified in Section 09900 – Protective Coatings. Do not shop-prime surfaces in contact with concrete or requiring field welding. Shop-prime in one (1) coat.

H. Aluminum grating and treads: Rectangular shaped or I-shaped bearing bars with minimum dimensions and weight according to clear span as follows unless otherwise indicated on the Drawings:

Rectangular Bar Type		**I-Bar Type**		**Span**	
Bearing Bar Size	**Wt. Pounds per Sq. Ft.**	**Bearing Bar Size**	**Wt. Pounds per Sq. Ft.**	**From**	**To**
1" x 3/16"	2.6	1" x 1/4"	1.8	Zero	2'-6"
1-1/4" x 3/16"	3.2	1-1/4" x 1/4"	2.2	2'-7"	3'-6"
1-1/2" x 3/16"	3.9	1-1/2" x 1/4"	2.7	3'-7"	4'-0"
1-3/4"x 3/16"	4.5	1-3/4" x 1/4"	3.1	4'-1"	5'-0"
2" x 3/16"	5.1	2" x 1/4"	3.6	5'-0"	5'-6"
2-1/4" x 3/16"	6.0	2-1/4" x 1/4"	4.5	5'-7"	6'-6"
2-1/2" x 3/16"	7.0	2-1/2" x 1/4"	5.3	6'-7"	7'-0"

   1. Manufacturers.
      a. McNichols "I-Bar."
      b. Amico "I-Bar."
      c. Or equal.
   2. I-shaped aluminum grating bearing bars are to be used in all outdoor locations and all stair treads.
   3. Tread bar depth.
      a. One and one-quarter inch (1-1/4") for two foot six inches (2'6") wide treads.
      b. One and one-half inch (1-1/2") for three foot (3'0") wide treads.
      c. One and three-quarter-inch (1-3/4") for four foot (4'0") wide treads.
   4. Bearing bars.

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a. Three-sixteenth inch (3/16") thick minimum or equivalent I-bars, with a maximum center to center spacing of one and three-sixteenth inches (1-3/16"), pressure locked or riveted.

5. Band all edges and openings.
   a. Provide full depth three-sixteenths inch (3/16") thick welded bands at ends of bearing bars.
6. Provide full width cross bars at right angle to bearing bar at maximum four-inch (4") spacing.
7. Cut cross bars flush with side bars face.
8. The top of the bearing bars or I-bars shall be serrated or deformed to provide positive traction.
9. Locate joints between sections at center of openings
10. Provide panels with weight of less than one hundred fifty pounds (150 lbs.).
11. Clean, smooth, and round cut edges.
12. Provide carrier plates and abrasive nosing on treads.
13. Panels shall be within three-sixteenth inches (3/16") of length and one-eighth inch (1/8") of width shown on the Shop Drawings.
14. Opposite diagonals of the panel shall be less than one-quarter inch (1/4") difference.
15. There shall be less than one-quarter inch (1/4") clear space between panels.
16. All frames to be set in concrete for gratings shall be fabricated using stainless steel, unless otherwise indicated on the drawings.

2.5 ACCESSORIES

A. All anchoring hardware shall be Type 304 Stainless Steel, unless otherwise noted on the Drawings.

B. Expansion Anchors.
   1. Fed. Spec. FF-S-325.
      a. Wedge type, Group II, Type 4, Class 1 or 2.
      b. Or self-drilling type, Group III, Type I.

C. Drop-In Anchors.
   1. All bolts and hardware to be Type 304 stainless steel.

D. Adhesive Anchors.
   1. Anchor Rod:
      a. Stainless steel threaded rod, diameter as shown, 30 ksi minimum yield strength.
      b. Length as required to provide minimum depth of embedment.

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c. Clean and free of grease, oil, or other deleterious material.

2. Adhesive: Refer to 03300.

E. Anchor Studs.

1. Headed end deformed anchors shall be by the following manufacturers.

a. Nelson Stud Welding Co.
b. KSM Stud Welding Systems.
c. Or equal.

2.6 CONSTRUCTION

A. Bolt.

1. Use unfinished bolts except where otherwise noted on Drawings.
2. Use self-locking nuts or lock washers on all bolts.
3. Use stainless steel bolts on aluminum fabrications.

B. Weld.

1. Weld continuously all butt and miter joints.
2. Grind smooth all exposed welds.
3. Provide at least two-inch (2") effective length not more than six inches (6") apart for intermittent welds.

C. Finishing.

1. Where finishing is indicated, complete the assembly including welding before finishing.

D. Check holes and connections prior to shipment for proper fit.

E. Provide holes required for fastening other items to structural members and for the passage of other items through structural members.

F. Mark each separate piece as indicated on fabrication and erection drawings.

G. Mark and match-mark members for field assembly.

H. Provide all field connection bolts, nuts, and washers.

I. Grind sharp corners and shear edges.

J. Clean steel surfaces by power brushing or blasting; remove weld splatter, flux, and slag.

K. Expansion Anchors and Drop-In Anchors.

1. Install in conformity with manufacturer's recommendations for maximum pull-out force.

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2. Provide minimum embedment of not less than four (4) bolt diameters.

3. Provide minimum clear space between holes of not less than two (2) times embedment depth.

4. Provide minimum edge distance to face or concrete of not less than embedment depth.

5. Set firmly in place by bolting to forms or templates.

L. Adhesive Anchors:

1. Begin installation only after concrete or masonry to receive anchors has attained design strength.

2. Install in accordance with manufacturer's instructions.

M. Anchor bolts.

1. Provide thread length to allow nut on concrete side of forms or template.

2. Provide extra nut for concrete side of forms or template.

3. Set firmly in place by bolting to forms or templates.

PART 3 EXECUTION

3.1 PREPARATION

A. Contractor shall check all lines and levels and verify existing conditions prior to commencing Work of this Section. Notify Engineer of any discrepancies or conditions which may affect the successful installation of the Work. Do not begin Work until such conditions are corrected in a manner acceptable to the Installer.

B. Contractor shall field verify all dimensions affecting the Work of this Section and coordinate fit and installation details with related trades prior to fabrication.

C. Ensure that items required to be cast into concrete or embedded in masonry are supplied to the site prior to concrete or masonry work, complete with necessary setting templates.

D. Ensure that ferrous metal surfaces have been properly painted or isolated where in contact with aluminum or other dissimilar metals as required to prevent electrolysis.

3.2 INSTALLATION

A. Install items square and level, accurately fitted, and free from distortion.

B. Make provision for erection stresses by temporary bracing. Keep work in alignment.

C. Replace items damaged in course of installation.

D. Perform field welding in accordance with AWS D1.1, AWS D1.2, or AWS D1.6.

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E. Connections.
   1. Clean joint contact surfaces.
   2. Assemble as shown on Shop Drawings.
   3. Drifting to match unfair holes shall not be permitted.
   4. Enlarge holes by reaming with twise drills.

F. Railings.
   1. Install railings with one-eighth inch (1/8”) of true alignment vertically and horizontally.

G. Grating.
   1. Shall lie flat without rocking.
   2. Provide stainless steel fastening devices to hold grating down. Anchor securely in place, as recommended in NAAMM manual.
   3. Use stainless steel anchors and provide stainless steel washers at contact surfaces.
   4. Provide aluminum or stainless steel clips or blocks.

END OF SECTION

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SECTION 05515 - LADDER SAFETY DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide a complete Saf-T-Climb fall prevention system.

B. Fall prevention systems must meet or exceed Federal Spec #RR-S-001301 and OSHA regulation #1910.27. Equipment must be tested according to ANSI 14.3-1974. Belts and harnesses must be tested according to ANSI 10.14-1975.

C. The Saf-T-Climb system consists of five (5) primary components.
   1. Saf-T-Grip Sleeve.
   2. Comfort fit Saf-T-Climb Harness
   3. Saf-T-Notch Carrier Rail.
   4. Ladder Rung Clamps
   5. Dismount Section

1.2 SUBMITTALS

A. Certification.
   1. Submit manufacturer's certification that products meet requirements of referenced specifications.

B. Submit manufacturer's data sheets for all components and Operation and Maintenance Manuals as required.

PART 2 PRODUCTS

2.1 MATERIALS

A. Saf-T-Grip Sleeve.
   1. Model # P/N 602-100-003.
      a. Tested to ANSI 14.3-1974.

B. Comfort Fit Saf-T-Climb Harness with Integrated Belt
   1. Model # P/N 733-201-00x.
      a. ANSI Class I belt with special front Saf-T-Climb ring.
      b. Designed to attach to a locking sleeve.
      c. With three inch (3") polyester body pad with minimum one thousand six hundred fifty pound (1,650 lb.) strength.
         1) Two (2) side rings and two (2) drop forged tongues.
      d. Must withstand a minimum drop test of two hundred fifty pounds (250 lbs.) in a six foot (6') free fall (ANSI 10.14-1975).

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C. Saf-T-Notch Carrier Rail.
   1. Model # P/N 526-10X-001.
      a. Notched rigid carrier rail.
      b. With stainless steel #316 channel.
      c. Extruded in a one-piece configuration.

D. Ladder Rung Clamps.
   1. Stainless Steel #316.
   2. Model # P/N 024-105-001.
      a. Stainless steel mounting bracket with serrated edges.
      b. Slotted at nine inch (9”) centers to fit round rung configurations up to one and one-quarter inches (1-1/4”).

E. Saf-T-Pivot Dismount Section.
   1. Specially designed to allow Saf-T-Grip sleeve to pivot three hundred sixty degrees (360°) around the rail.

2.2 ACCESSORIES

A. Comfort Fit Saf-T-Climb Harness.
   1. Model # P/N 733-201-XXX.
      a. ANSI Class III body harness with special front Saf-T-Climb ring designed to attach to a locking sleeve.
      b. With three inch (3”) body pad.
      c. Two (2) drop forged tongues in buckle.
      d. Two (2) side rings on belt.
      e. Three (3) shoulder rings on harness section.
      f. Must withstand minimum drop test of two hundred fifty pounds (250 lbs.) in a six foot (6’) free fall (ANSI 10.14-1991).
      g. Size: Coordinate with Owner.
      h. Quantity: Two (2)

B. Saf-T-Lanyard.
   1. Model # P/N 732-200-072.
      a. Adjustable nylon filament rope lanyard, one-half inch (1/2”) diameter, with double locking snap at each end.
      b. Lanyard adjustable from thirty-six inches (36”) to seventy-two inches (72”).
   2. Quantity: Two (2).

2.3 MANUFACTURERS

A. North Safety Products.

B. Or equal.

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PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's specification and installation instructions.

END OF SECTION

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SECTION 05999 – MISCELLANEOUS METALS

PART 1 GENERAL

1.1 DESCRIPTION

A. This section covers miscellaneous items of ferrous and non-ferrous metals.

B. Related work specified elsewhere:
   1. Section 05500 – Metal Fabrications.
   2. Section 09900 – Protective Coatings.

1.2 WORK FURNISHED BUT INSTALLED BY OTHERS

A. Section 03300 – Cast-In-Place Concrete: Metal Fabrications Cast-in-Concrete.

1.3 QUALITY ASSURANCE

A. Reference Standards: Conform to the requirements of the most current version of the referenced standards and codes from the following organizations:
   1. Aluminum Association, AA.
   2. American Institute of Steel Construction, AISC.
   3. American National Standards Institute, ANSI.
   4. American Society of Mechanical Engineers, ASME.
   5. ASTM International, ASTM.
   6. American Welding Society, AWS.
   7. International Building Code, IBC.
   8. National Association of Architectural Metal Manufacturers, NAAMM.
   9. Research Council on Structural Connections, RCSC.
   10. International Code Council, ICC.

B. Welding procedures, welders, and welding operations shall be qualified and certified in accordance with the American Welding Society (AWS).
   1. Maintain welder's certification on file at site.
   2. Certification or re-certification shall be within six (6) months before commencing any welding operations.

C. Perform all work in accordance with the requirements of the International Building Code, IBC.

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1.4 SUBMITTALS

A. Submit manufacturer's data sheets for all products showing compliance with the referenced standards.

B. Submit weld inspection reports certified by an AWS-certified weld inspector and a New Mexico registered Professional Engineer.

C. Submit copies of welder's certifications for welding procedure specifications for all work prior to commencing work.

PART 2 PRODUCTS

2.1 STEEL

A. Plates, shapes, and bars.
   1. W and WT shapes: ASTM A992, 50 ksi yield strength.
   2. All other products: ASTM A36, except as otherwise indicated.

B. Pipe: Black, welded and seamless, galvanized and coated, ASTM A53, grade B.

C. Structural tubing.
   1. Rectangular HSS: ASTM A500, grade B, 46 ksi yield strength.
   2. Round HSS: ASTM A500, grade B, 42 ksi yield strength.

D. Sheet and strip: Carbon steel, structural quality, ASTM A1008 or A1011, grade 40, 45, or 50.

E. Bolts.
   1. Unfinished and High Strength: ASTM A325 or A490.
   2. Galvanized: ASTM A325 bolts with oversized nuts, hot-dip ASTM A153 or A385.
   3. Twist-Off-Type Tension-Controlled Bolts: ASTM F1852.

F. Nuts.
   1. Heavy hex nuts: ASTM A563.
   2. Self-locking nuts: IFI-100, Grade A, torque type.

G. Washers.
   1. Flat Washers:
      a. ASTM F436, except as noted in b.
      b. Long slotted holes:
         1) For use with ASTM A490 bolts greater than 1 inch in diameter: ASTM F436 washer with 3/8 inch thick structural grade plate washer or continuous bar.

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2) All other applications: 5/16 inch thick plate washer or continuous bar.

2. Beveled Washers: ASTM F436.

3. Lock Washers: ANSI B18.21.1, helical spring.

4. Load Indicating Washers: ASTM F959, compressible-washer-type direct-tension indicators, tested in accordance with ASTM F959, Article 10.2.

H. Anchor Rod: ASTM F1554, grade 36 or 55, weldable.

I. Threaded Rod: ASTM A36.

2.2 STAINLESS STEEL

A. Plates, shapes, and bars: 300 series, ASTM A167, A276, A480, and A786.

B. Pipe: ASTM A312 or A270.

C. Sheet and strip: ASTM A167, A480 and A666.

D. Fittings and flanges: ASTM A774.

E. Bolts: ASTM F593, alloy group 1 or 2.

F. Nuts: ASTM F594, alloy group 1 or 2.

G. Washers.

1. Flat: ASTM B18.22.1, 300 series.

2. Lock Washers: ASTM B18.21.1, helical spring type, 300 series.

H. Anchor Rod: ASTM A193, grade B8, 30 ksi minimum yield strength.

I. Threaded Rod: ASTM A193, grade B8, 30 ksi minimum yield strength.

2.3 ALUMINUM

A. Sheet and Plates: ASTM B209, Alloy 6061-T6.

B. Extrusions: ASTM B221, Alloy 6063-T5 or T6.

C. Structural Shapes: ASTM B308, Alloy 6061-T6.

D. Rod and Bar: ASTM B211, Alloy 6061-T6 or 2014-T6.

E. Pipe: ASTM B429, Alloy 6061-T6, or 6063-T6.

F. Castings: ASTM B26 or B85.

G. Checkered plate: Alcoa C102, Alloy 6061-T6.

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2.4 CAST IRON

A. Material: ASTM A48, Class 35.

2.5 DUCTILE IRON

A. Trench Drain Grate Material: ASTM A536, Grade 65-45-12.

2.6 STRUT SYSTEMS

A. Stainless steel strut and hardware.

B. Manufacturer: Cooper B-Line, or approved equal.

2.7 WELDING

A. Welding Materials: As specified in AWS D1.1, D1.2, D1.3, or D1.6 as applicable for type of materials being welded.

2.8 COATINGS

A. Corrosion-Inhibitive Primer.
   1. Carboline, “Carbogard 888”, 3-5 mils dry film thickness.
   2. Tnemec, “37H Chem-Prime H.S.”, 2-3.5 mils dry film thickness.
   3. Or equal.

B. Coal Tar Paint.
   1. Sherwin Williams, “TarGuard Coal Tar Epoxy,” 8-16 mils dry film thickness.
   2. Tnemec, “Series 46-465 H.B. Tnemecol,” 8-12 mils dry film thickness.
   3. Or equal.

C. Galvanizing Repair Paint: High zinc dust content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A.

2.9 GALVANIZING

A. ASTM A123, A153, or A385.

B. Pickle before galvanizing.

C. Hot dip after fabrication.

PART 3 EXECUTION

3.1 STEEL

A. General: Conform to AISC, Steel Construction Manual, Thirteenth Edition.

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B. Bolted Connections.
   1. Provide unfinished bolts unless noted otherwise.
   2. Provide self-locking nuts or lock washers for all bolts.
   3. High Strength Bolted Connections: Conform to RCSC, Specification for Structural Joints Using ASTM A325 or A490 Bolts, 2004.

C. Coatings.
   1. Prepare substrates in accordance with coating manufacturer's recommendations.
   2. Apply coatings in accordance with substrate manufacturer's recommendations.
   3. Shop coat all ungalvanized steel with corrosion-inhibitive primer.

D. Welding.
   1. All welding shall be completed by AWS certified welders in accordance with AWS D1.1 using prequalified procedures.
   2. Filler metal.
      a. Comply with AWS D1.1, 70 ksi, minimum tensile yield strength.
      b. Do not use stainless filler metal with galvanized base metal.
   3. Weld prior to galvanizing except where noted for field welding.
   4. Coat field welds of galvanized base metal with galvanizing repair paint in accordance with ASTM A780.

3.2 STAINLESS STEEL

A. Clean, degrease, and pickle after fabrication to remove all embedded iron and heat tint.

B. Coatings: Stainless steel components shall not be coated unless otherwise noted.

C. Welding.
   1. All welding shall be completed by AWS certified welders in accordance with AWS D1.6 using prequalified procedures.
   2. Filler metal:
      a. 308, 309, or 316 in accordance with AWS D1.6.
      b. Do not use stainless steel filler metal with galvanized base metal.

3.3 ALUMINUM

A. General: Conform to AA, Aluminum Design Manual.

B. Bolted Connections: Provide stainless steel bolts, nuts, and washers for aluminum connections unless noted otherwise.

C. Coatings: Coat aluminum with coal tar paint at surfaces that will be in contact with concrete, mortar, or dissimilar metals other than stainless steel.

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D. Welding.
   1. All welding shall be completed by AWS certified welders in accordance with AWS D1.2 using prequalified procedures.
   2. Filler metal: Comply with AWS D1.2.

3.4 FIELD ERECTION

A. Erect all components plumb, level, and aligned within a tolerance of 1:500.

3.5 FIELD QUALITY CONTROL

A. Provide platform or manlift for bolt and weld inspection as required.

B. Provide visual inspection of all field welds by a third party AWS-certified weld inspector.

END OF SECTION

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SECTION 09900 – PROTECTIVE COATING SYSTEM E-1

Service	Steel & Iron – Non-Potable Liquid Immersion, Normal to Severe Exposure Interior of Tank or Basin. Exterior of Steel, Piping, or Equipment in Tank or Basin
Surface Preparation	Shop or Field First Coat: SSPC-SP5 and profile depth of 1.5 to 2.5 mils (0.038 to 0.064 mm) Field touch up: Same as first coat.
First (Prime) Coat	High solids amine or polyamidoamine epoxy coating, with minimum 67% solids by volume. Apply at 5.0 mils (0.127 mm) dry film thickness.
Second Coat	Same as first coat
Third Coat	N/A
System Total	Minimum 10.0 mils (0.254 mm) dry film thickness. Check for voids with holiday or pinhole detector.
Volatile Organic content	Maximum 2.8 lb/gal (340 g/L).

COATING MANUFACTURER	PRODUCT DESIGNATION			
	FIRST COAT	TOUCH UP	SECOND COAT	THIRD COAT
Ameron	Amerlock 400	Same as first coat	Same as first coat	
Carboline	Carboguard 890	Same as first coat	Same as first coat	
ICI Devoe	Bar-Rust 235	Same as first coat	Same as first coat	
International	Interseal 670 HS			
Pittsburg Paints	Pitt-guard DTR 97-145 Series	Same as first coat	Same as first coat	
Tnemec	Epoxoline II-69	Same as first coat	Same as first coat	

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SECTION 09900 – PROTECTIVE COATING SYSTEM E-2

Service	Steel & Iron – Potable Water Immersion, Normal Service Interior of Tank or Basin. Exterior of Steel Piping or Equipment in Tank or Basin
Surface Preparation	Shop or Field First Coat: SSPC-SP5 and profile depth of 1.5 to 2.5 mils (0.038 to 0.064 mm) Field touch up: Same as first coat.
First (Prime) Coat	High solids amine, polyamine, or polyamidoamine epoxy coating, with minimum 62% solids by volume, and be for use with potable water meeting NSF Standard 61. Apply at 5.0 mils (0.127 mm) dry film thickness.
Second Coat	Same as first coat
Third Coat	N/A
System Total	Minimum 10.0 mils (0.254 mm) dry film thickness. Check for voids with holiday or pinhole detector.
Volatile Organic content	Maximum 2.8 lb/gal (340 g/L).

COATING MANUFACTURER	PRODUCT DESIGNATION			
	FIRST COAT	TOUCH UP	SECOND COAT	THIRD COAT
Ameron	Amercoat 395 FD	Same as first coat	Same as first coat	
Carboline	Carboguard 891	Same as first coat	Same as first coat	
ICI Devoe	Bar-Rust 233 H	Same as first coat	Same as first coat	
Tnemec	Pota-Pox Plus, Series N140	Same as first coat	Same as first coat	

END OF SECTION

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SECTION 09900 - PROTECTIVE COATINGS

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes coating of exterior and interior surfaces throughout the Project and which are listed in PART 2, with systems specified on "coating system" sheets at the end of this Section.

B. Coating systems include surface preparation, prime coat (first coat), finish coats (second and third coats), inspection, cleaning, and touch-up of surfaces and equipment. Shop preparation, prime coat, and finish coats to be shop-applied, may be specified elsewhere or referenced to this Section so that a complete system is specified and coordinated.

1. Where surface preparation and first (prime) coat are specified in other Sections to be shop-applied, such as for structural steel, hollow metal doors or equipment, only the touch-up and finish coats are a part of field painting. Surface preparation is the required degree of preparation prior to application of first (prime) coat regardless if done in shop or field.

2. If materials are provided without shop primer such as miscellaneous steel or sheet metal, then surface preparation, first, second, and third coats are a part of field painting.

3. Concealed surfaces are generally not required to have finish-coats unless otherwise specified, but prime coat should be applied and touched up prior to concealment.

4. Where Equipment and Materials are provided with shop-applied finished coating system, only touch-up is a part of field painting.

5. Refer to applicable Sections to determine whether surface preparation and first coat, or complete coating system, is to be shop-applied.

C. Related Work Specified Elsewhere: None

D. Colors:

1. Colors of finish coatings shall match accepted color Samples.

2. When second and finish coats of a system are of same type, tint or use an alternate color on second coat to enable visual coverage inspection of the third coat. When first and second coats only are specified and are of same or different types, tint or use an alternate color on first coat to enable visual coverage inspection of the second coat.

3. Contract Price shall include the following approximate number of finish coat colors to form a basis for bidding:

   a. Alkyd: Four colors, with 50% deep tone colors.
   b. Acrylic: Four colors, with 50% deep tone colors.

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c. Epoxy: Fifteen colors, with 50% deep tone colors.
d. Polyurethane: Four colors, with 50% deep tone colors.

1.2 REFERENCES:

A. Applicable Standards:
1. American National Standards Institute (ANSI):
a. A13.1 - Scheme for the Identification of Piping Systems.
b. Z53.1 - Safety Color Code for Marking Physical Hazards.
2. American Society for Testing and Materials (ASTM):
a. D2092 - Guide for Treatment of Zinc-Coated (Galvanized) Steel Surfaces for Painting.
b. D4258 - Surface Cleaning Concrete for Coating.
c. D4259 - Abrading Concrete.
d. D4260 - Acid Etching Concrete.
e. D4261 - Surface Cleaning Concrete Unit Masonry for Coating.
3. Society for Protective Coatings (SSPC) Surface Preparation Specifications:
a. SP1 - Solvent Cleaning: Removes oil, grease, soil, drawing and cutting compounds, and other soluble contaminants.
b. SP5 - White Metal Blast Cleaning: Removes all scale, rust, foreign matter. Leaves surface gray-white uniform metallic color.
c. SP6 - Commercial Blast Cleaning: Two-thirds of every nine square inches free of all visible residues; remainder only light discoloration.
d. SP11 - Power Tool Cleaning to Bare Metal.
e. SP13 - Surface Preparation of Concrete.
4. National Sanitation Foundation (NSF):
a. 61 - Drinking Water Treatment Chemicals -Health Effects.

1.3 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Includes, but not limited to, the following:
1. Schedule of products and paint systems to be used. Schedule shall include the following information:
a. Surfaces for system to be applied.
b. Surface preparation method and degree of cleanliness.
c. Product manufacturer, name, and number.
d. Method of application.
e. Dry film mil thickness per coat of coating to be applied.
2. Color charts for selection and acceptance.
3. Technical and material safety data sheets.
4. Certification by coating manufacturer(s) that all coatings are suitable for service intended as stated on each coating system sheet. If manufacturer has an

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equivalent product as that specified, but it is not suitable for the intended purpose, Contractor shall submit the recommended product for approval at no increase in cost, and state reasons for substitution.

5. Contractor shall certify in writing to the Engineer/Architect that applicators have previously applied all the systems in this Specification and have the ability and equipment to prepare the surfaces and apply the coatings correctly.

C. Submittals for industrial maintenance coatings shall be prepared by, or have assistance in preparation of, a corrosion engineer or industrial coatings technical representative of the coating manufacturer.

1.4 QUALITY ASSURANCE:

A. Certification: Coating work shall be performed by an SSPC certified contractor having a minimum of Category QP 1 certification for work without hazardous paint removal, and Category QP 2 certification for work involving hazardous paint removal.

B. Include on label of container:
1. Manufacturer's name, product name, and number.
2. Type of paint and generic name.
3. Color name and number.
4. Storage and temperature limits.
5. Mixing and application instructions, including requirements for precautions which must be taken.
6. Drying, recoat, or curing time.

C. Prepainting Conference:
1. Before project field painting starts, representatives for the Owner, Contractor, coating applicator, and coating manufacturer's technical representative shall meet with Engineer/Architect.
2. Agenda for the meeting will include details of surface preparations and coating systems to ensure understanding and agreement by all parties for compliance.

D. A coating report shall be completed daily by Contractor at each phase of the coating system starting with surface preparation. These shall be submitted on the form attached at end of this Section.

E. In the event a problem occurs with coating system, surface preparation, or application, Contractor shall require coating applicator and coating manufacturer's technical representative to promptly investigate the problem and submit results to Engineer/Architect.

F. Stated VOC shall be unthinned maximum VOC certified by manufacturer.

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1.5 DELIVERY, STORAGE, AND HANDLING:

A. Delivery of Materials:
   1. Deliver in sealed containers with labels and information legible and intact. Containers shall also have correct labels with required information.

1.6 REGULATORY REQUIREMENTS:

A. In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local and regional jurisdiction. Notify Engineer/Architect of any coating specified herein that fails to conform to the requirements for the location of the Project or location of application.

B. Lead Content: Use only coatings that are totally lead free.

C. Chromate Content: Do not use coatings containing zinc-chromate or strontium chromate.

D. Asbestos Content: Materials shall not contain asbestos.

E. Mercury Content: Materials shall not contain mercury or mercury compounds.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Proprietary names and product numbers are specified in most systems for material identification from these manufacturers:
   1. Ameron Protective Coatings Systems Group, Ameron Corp.
   2. Carboline Company, Inc.
   3. Devoe Coating Company, Division of ICI.
   4. Futura Coatings, Inc.
   5. International Protective Coatings.
   6. Pittsburgh Paints, PPG Industries Inc.
   7. Tnemec Company, Inc.
   8. Sherwin Williams Co.
   9. Equivalent coatings on approval by Engineer/Architect.

2.2 GENERAL

A. Materials furnished for each coating system must be compatible to the substrate.

B. When unprimed surfaces are to be coated, entire coating system shall be by the same coating manufacturer to assure compatibility of coatings.

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C. When shop-painted surfaces are to be coated, ascertain whether finish materials will be compatible with shop coating. Inform Engineer/Architect of any unsuitable substrate or coating conditions.

2.3 COATING SYSTEMS:

A. Specified on the "Protective Coating System" sheets at the end of this Section.

2.4 SURFACES TO BE COATED:

A. System E-1:
   1. Interior piping, valves and related components.
   2. Pumps.
   3. Strainers.
   4. Mixers.
   5. Sluice, slide and stop gates (interior).

B. System E-2:
   1. Potable water immersion piping exterior, valves and related components.
   2. Potable water immersion - pumps.

2.5 SURFACES NOT TO BE COATED:

A. Do not field coat any of the following items unless specifically noted otherwise.
   1. Metal surfaces of aluminum, stainless steel, copper and similar finished materials.
   2. PVC coated conduit.
   3. PVC conveyance piping (colored tag or band, arrows, and size indicators to be provided).

2.6 COLOR CODING OF PIPING AND PHYSICAL HAZARDS:

A. Color Coding of Piping: Exterior and interior.
   1. General:
      a. Coat piping with solid colors as specified below for entire length of pipe in exposed finished and unfinished areas.
      b. Coat all other piping in colors matching adjacent surfaces. If adjacent area is unfinished, paint in color determined by Engineer/Architect.
      c. Identify piping with legend and arrows as specified below. Apply after completion of finish coating.

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2. Color Scheme:

Item	Pipe Color	Letter and Arrow Color
Raw	Olive green	Black
Pretreated	Aqua	White
Finished or Potable	Dark Blue	White
Backwash Waste	Light Brown	White
Sewer (sanitary or other)	Dark Gray	
Compressed Air	Dark Green	White
Gas	Red	White
Chlorine (gas and solution)	Yellow	
Chlorine Dioxide	Yellow with Violet Band	
Coagulant	Orange	
Polymer Solutions	Orange with Green Band	
Other Lines	Light Gray	Black

3. Location of Legends and Arrows:

   a. Place on piping near connections to Equipment, adjacent to valves or fittings, on both sides of walls penetrated, and at intervals not to exceed 50 feet.
   b. Place arrows adjacent to or below legends depending upon visibility. Place arrows in direction of flow. For dual-flow piping, indicate both directions.
   c. Locate legends to be visible from normal line of vision above floor level. Legend locations subject to approval of Engineer/Architect.

4. Letter Size:

   a. Block-style letters, all capitals, conforming to ANSI A13.1 and as follows:

Outside Diameter of Pipe or Covering	Size of Letters and Arrows
3/4"	Approved metal tag or band
3/4" to 1-1/4"	1/2"
1-1/2" to 2"	3/4"
2-1/2" to 6"	1-1/4"
8" to 10"	2-1/2"
Over 10"	3-1/2"

B. Color Coding Physical Hazards: Exterior and interior.
   1. General:

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a. Paint areas indicated to identify physical hazard areas as required by ANSI Z53.1.
b. All colors shall conform to Federal Safety Color Code requirements.

2. Color Coding:

Area or Item	Color
Fire Protection Equipment and Apparatus, Danger or Stop	Red
Caution - Stationary Hazards	Yellow

PART 3 EXECUTION

3.1 SURFACE PREPARATION:

A. Prepare surfaces for each coating system conforming to SSPC or ASTM surface preparation specifications listed.
1. If grease or oils are present, SSPC-SP1 shall precede any other method specified for metal substrates.

2. Remove surface irregularities such as weld spatter, burrs, or sharp edges prior to specified surface preparation.

B. Depth of profile will be as specified or as recommended by the manufacturer for each system, but in no instance shall it exceed one-third of the total dry film thickness of complete system.

C. Prepare only those areas which will receive the first coat of the system on the same day.
1. On steel substrates, apply coating before rust bloom forms.

D. Concrete and masonry surfaces shall be adequately cured prior to coating application.
1. Use surface cleaning methods, followed by mechanical or chemical surface preparation as specified in SSPC SP13.

a. Acid etching (ASTM D4260) shall not be used for vertical surfaces.
b. Acid etching shall only be used where:
1) Procedures are in place for removal of acid residues and the handling, containment, and disposal of hazardous materials.
2) Measures for protection of worker health and safety are provided.

E. For new galvanized steel to be coated, if absence of hexavalent stain inhibitors is not documented, test as described in ASTM D2092, Appendix X2, and remove by one of the methods described therein.

3.2 APPLICATION:

A. Apply coatings in accordance with coating manufacturer's recommendations.

B. Use properly designed brushes, rollers, and spray equipment for all applications.

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C. On unprimed surfaces apply first coat of the system the same day as surface preparation.

D. Dry film thickness of each system shall meet the minimum specified. Maximum dry film thickness shall not exceed the minimum by more than 20%, or coating manufacturer's requirements if less. Where a dry film thickness range is specified, the range shall not be less than or exceeded.

E. Shop and field painting shall remain 3 inches away from unprepared surface of any substrate such as areas to be welded or bolted.

F. Environmental Conditions:
   1. Atmospheric temperature must be 10°C (50°F) or higher during application, unless otherwise approved by coating manufacturer. Do not apply coatings when inclement weather or freezing temperature may occur within coating recoat cure times.
   2. Wind velocities for exterior applications shall be at a minimum to prevent overspray or fallout and not greater than coating manufacturer's limits.
   3. Relative humidity must be less than 85% and the temperature of the surface to be painted must be at least 5°F (2.8°C) above the dew point.
   4. Provide adequate ventilation in all areas of application to ensure that at no time does the content of air exceed the Threshold Limit Value given on the manufacturer's Material Safety Data Sheets for the specific coatings being applied.

G. Recoat Time: In the event a coating, such as an epoxy, has exceeded its recoat time limit, prepare the applied coating in accordance with manufacturer's recommendations.

H. Protection:
   1. Cover or otherwise protect surfaces not to be painted. Remove protective materials when appropriate.
   2. Mask, remove, or otherwise protect finish hardware, machined surfaces, grilles, lighting fixtures, and prefinished units as necessary.
   3. Provide cover or shields to prevent surface preparation media and coatings from entering orifices in electrical or mechanical Equipment. Where ventilation systems must be kept in operation at time of surface preparation, take precautions to shield intakes and exhausts to prevent the materials from entering system or being dispersed.
   4. Provide signs to indicate fresh paint areas.
   5. Provide daily cleanup of both storage and working areas and removal of all paint refuse, trash, rags, and thinners. Dispose of leftover containers, thinners, rags, brushes, and rollers which cannot be reused in accordance with applicable regulations.

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6. Do not remove or paint over Equipment data plates, code stamps on piping, or UL fire rating labels.

3.3 INSPECTION:

A. Contractor shall provide and use a wet film gauge to check each application approximately every 15 minutes in order to immediately correct film thickness under or over that specified.

B. Contractor shall provide and use a dry film gauge to check each coat mm (mil) thickness when dry, and the total system mm (mil) thickness when completed.

C. Contractor shall provide and use holiday or pinhole detector on systems over metal substrates to detect and correct voids when indicated on system sheet.

D. Furnish a sling psychrometer and perform periodic checks on both relative humidity and temperature limits.

E. Check temperature of the substrate at regular intervals to be certain surface is 5°F (2.8°C) or more above the dew point.

3.4 CLEANING AND REPAIRS:

A. Remove spilled, dripped, or splattered paint from surfaces.

B. Touch up and restore damaged finishes to original condition. This includes surface preparation and application of coatings specified.

END OF SECTION

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SECTION 09900 - COATING REPORT

Contract Name: Village of Taos Ski Valley Kachina Water Storage Tank.....

Contract Number:.....

Coating Contractor:..... Foreman: .....

Unit or Surface Identification .....

Unit or Surface Location: Exterior..... Interior: .....

SURFACE PREPARATION:

Date: ..... Air Temp:..... °F; Relative humidity..... %

Method of Surface Preparation .....

Profile Achieved: .... mils (if applicable).

TOUCH UP:

Date: ..... Time: ..... Air Temp:..... °F; Surface Temp ..... °F

Relative humidity: .....% Dew Point: ..... °F

Coating used: .... Dry film obtained.....mils.

FIRST COAT:

Date: ..... Time: ..... Air Temp:..... °F; Surface Temp ..... °F

Relative humidity: .....% Dew Point: ..... °F

Coating used: .....

Dry time before recoat: ..... hrs. Dry film obtained .....mils.

SECOND COAT:

Date: ..... Time: ..... Air Temp:..... °F; Surface Temp ..... °F

Relative humidity: .....% Dew Point: ..... °F

Coating used: .....

Dry time before recoat: ..... hrs. Dry film obtained .....mils.

THIRD COAT:

Date: ..... Time: ..... Air Temp:..... °F; Surface Temp ..... °F

Relative humidity: .....% Dew Point: ..... °F

Coating used: .....

Dry time before recoat: ..... hrs. Dry film obtained .....mils.

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SECTION 13400 - MEASUREMENT AND CONTROL INSTRUMENTATION

PART 1 GENERAL

1.1 SUMMARY:

A. The work of this section consists of furnishing and installing free standing instrument panels, wall mounted instrument panels, main control panels, panel mounted instruments and devices, and field mounted instruments and devices. Coordinate entire instrumentation installation.

B. Related Work specified elsewhere:
   1. Section 01110 – Summary of Work
   2. Section 01330 – Submittals
   3. Section 15105 – Process Valves and Accessories
   4. Division 16 - Electrical

1.2 REFERENCES

A. ISA SS.I-Instrumentation symbols.

B. ISA SS.4-Instrument Loop Diagrams.

C. IEEE-All applicable standards.

D. NEMA ICS I-General Standards for Industrial Controls and Systems.

E. NEMA 2-Industrial Control Devices, Controllers and Assemblies.

F. NEMA 3-Industrial Systems.

G. NEMA ICS6-Enclosures for Industrial Control and Systems.

H. NEMA 2S0-Enclosures for Electrical Equipment.

I. UL-All applicable sections.

J. NFPA 70-National Electrical Code.

1.3 DEFINITIONS

A. Process and Instrument Diagram or Connections Diagram: A process or flow diagram is a conceptual diagram of the functional interrelationship of subsystems in block or pictorial form. Process equipment such as machinery is shown for proper understanding.

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B. Schematic Diagram or Elementary Diagram: A schematic or elementary diagram is one that shows all circuits and device elements of a system or piece of equipment and its associated apparatus or any clearly defined functional portion thereof. Such a diagram emphasizes the device elements of a circuit and their functions as distinguished from the physical arrangement of the conductors, devices or elements of a circuit system.

C. Wiring Diagram or Connection Diagram: A wiring or connection diagram is one that locates and identifies electrical devices, terminals, and interconnecting wiring in an assembly. This diagram shall be in a form showing interconnecting wiring by lines or indicating interconnecting wiring only be terminal designations.

D. Interconnecting Diagram: An interconnection diagram is one that shows only the external connections between controllers, control panels, and associated machinery and equipment.

E. Dimension or Outline Drawing: A dimension or outline drawing (base plan, floor plan, and so forth) is one that shows the physical space and mounting requirements of a piece of equipment. It shall be permitted to also indicate ventilation requirements and space provided for connections or the location to which connections are to be made.

F. One-Line Diagram (Single-Line): A one-line or single-line diagram is one that shows, by means of single lines and graphic symbols, the course of an electrical circuit or circuits and the component devices or parts used therein. Physical relationships are usually disregarded.

G. Logic Diagram: A logic diagram is a particular form of one-line or single-line diagram of a logic circuit using logic symbols.

H. Block Diagram: A block diagram is made up of a group of interconnected blocks, each of which represents a device or subsystem.

I. Loop Diagram: A loop diagram is a collection of all components of an individual instrumentation system, or loop, showing the field, junction, panel rear and front connection points and all associated equipment.

J. Wireless Connection Diagram: The general physical arrangement of devices in control equipment and connections between these devices, terminals, and terminal boards for outgoing connections to external apparatus. Connections are shown in tabular form and not by lines. An elementary (or schematic) diagram may be included in the connection diagram.

1.4 SYSTEM INTERFACE COORDINATION

A. Provide all buffers, isolators, signal converters and amplifiers for interfacing with existing equipment, equipment furnished under another section and between items of equipment furnished hereunder, whether or not such interfacing is indicated on the Drawings or detailed specification.

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1.5 DESIGN REQUIREMENTS

A. Equipment Interfacing:
   1. Analog signals to equipment by others or under other Section: 4 to 20 milliamperes direct current (DC), negative ground for a total loop impedance of0 to 500 ohms.
   2. Analog signals from equipment by others or under other Section: 4 to 20 milliamperes DC, negative ground, suitable for 100 to 500 ohms loop impedance.
   3. Provide all required buffers, isolators, signal converters, and amplifiers for coordination with existing equipment, equipment furnished under another Section, and between items of equipment furnished hereunder, whether or not indicated on the Drawings or detailed Specifications.

B. Power Supply:
   1. Provide all required power conversion equipment for operation of all electric and electronic items from a 120 volt alternating current (AC) plus or minus 12 volts AC power supply source.
   2. Provide isolation transformers in each instrument panel to supply all panel loads except lighting.

1.6 PERFORMANCE REQUIREMENTS

A. General:
   1. Items will perform to limits of Manufacturer's published accuracy.

B. Metering Accuracy:
   1. Pressure: Error within 1 percent of the total head imposed on the measuring element.
   2. Level: Error within 1 percent of the measured range.
   3. Flow: Agreement of the measuring system with the flow head curves of the different producers within 2 percent over a 5-to-l range for control and 8-to-l range for instrumentation.

C. Modulating Control:
   1. Range: Stable performance over a 6-to-l operating range with an accuracy within 2 percent over a 5-to-l range.
   2. Stability: After controls have taken corrective action, as a result of a change in load or set point, the oscillations of a controlled element does not exceed 2 cycles per minute.
   3. Response: Any change in rate setting produces a corresponding change in the final element and becomes stable within 30 seconds.
   4. Agreement: Variable indicators and rate setting indicators agree within 3 percent of full scale over a 6 to 1 operating range.

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5. Sensitivity: During stable performance, instrument pointer or pen oscillations within 1 percent of scale

1.7 SUBMITTALS

A. As specified in Section 01330

B. Made in the name of the responsible supplier of the system.

C. Shop Drawings and Product Data:
   1. Complete fabrication, assembly and installation drawings.
   2. Schematic, wiring, and connection diagrams.
   3. Dimension and outline drawings.
   4. Loop diagrams.
   5. Details, specifications, and data describing instruments, materials, devices, and accessories.
   6. Differential producers:
      a. Certified standard calibration curve.
      b. Cover the entire specified range.
      c. Calibration curve legible to 0.5 percent of flow.
   7. Environmental requirements:
      a. Temperature.
      b. Minimum and maximum flow or pressures.
   8. Accuracy and repeatability:
      a. Individual components.
      b. Total system.
   9. Calibration requirements:
      a. Initial.
      b. Periodic.
   10. Power requirements:
      a. Provide manufacturers data

D. Samples:
   1. Manufacturer's standard panel colors for selection by the Project Engineer.
   2. Two sets of 8 inch by 10 inch color photographs or each freestanding panel showing front and interior views taken after fabrication, assembly, and painting.

E. Test Reports:
   1. Instrument record calibration sheet.
   2. Instrument loop record sheet.

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F. Manufacturer's Instructions.
   1. Provide Manufacturer's Instructions

1.8 PROJECT RECORD DOCUMENTS

A. As specified in Section 01330.

B. As-configured loop record sheets.

C. As-calibrated instrument calibration sheets.

D. As-built vendor drawings:
   1. Instruments that are provided
   2. Fiber optic connection diagram
   3. Booster Pump Station Modifications

E. Hard-copy

F. AutoCAD® Release 2015 drawing files or more recent release

G. Red-lined Contract Documents

H. Submit under provisions of Section 01330.

1.9 OPERATION AND MAINTENANCE

A. As specified in Section 01330.

B. Operation Data: Complete and detailed instruction manual

C. Maintenance Data:
   1. Recommended spare parts list.
   2. Preventative maintenance schedule.
   3. Calibration schedule and detailed calibration instructions.

1.10 QUALITY ASSURANCE

A. Equipment designed, coordinated and supplied by a single responsible manufacturer or supplier of both electrical and system components

1.11 QUALIFICATIONS

A. Acceptable Suppliers:
   1. Designed, coordinated, and supplied by a single responsible Manufacturer or supplier of both electrical and pneumatic metering and control systems
   2. Five years minimum experience in installing instrumentation systems

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1.12 REGULATORY REQUIREMENTS

A. Underwriters Laboratories

B. National Fire Protection Association

1.13 PRE-INSTALLATION CONTROLS CONFERENCE

A. Convene within 60 days after Notice To Proceed, and before development and submittal of shop Drawings, under provisions of Section 01110

B. Conference will be used to discuss requirements of this Section and 16903.

C. Present written request for clarifications to the Project Engineer

1.14 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01600

B. Store and protect products under provisions of Section 01600

C. Accept products on site in factory containers and verify condition of product

1.15 ENVIRONMENTAL REQUIREMENTS

A. Do not install instruments until spaces are suitably protected from weather, moisture, and damage from other trades

B. Maintain protection of instruments during and after installation

C. Any items damaged during construction will be repaired or replaced at the Project Engineer's discretion

1.16 FIELD MEASUREMENTS

A. All field measurements are to be verified and indicated on shop Drawings

1.17 SEQUENCING

A. Sequence Work under the provisions of Section 01110

1.18 COORDINATION

A. Coordinate the Work under provisions of Section 01110

B. Coordinate requirements of the Work with the electrical Contractor and schedule any required shutdowns with General Contractor under provisions of Section 01110

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1.19 WARRANTY

A. Work shall be performed under the Contractor's warranty or the correction period shall be done by employees of the instrument supplier, or of an authorized agency

PART 2 PRODUCTS

2.1 INSTRUMENT AND CONTROL PANELS

A. Wall Mounted Enclosure:
   1. Materials:
      a. Front: 14 gauge minimum steel plate
      b. Sides, top and doors: 14 gauge steel
      c. Rating:
         1) Indoor, controlled environment: NEMA 12, unless otherwise specified
         2) Indoor, corrosive environment: NEMA 4X, unless otherwise specified
         3) Outdoor: NEMA
         4) unless otherwise specified
   2. Door Clamps: Stainless Steel
   3. Fabrication:
      a. Dimensions as indicated on Drawings, or as required for the equipment specified
      b. Indoor, wall mounted, protecting components from dust, dirt, oil and water
      c. Doors:
         1) Approx. full height
         2) Heavy gauge continuous hinge pin
         3) Door and body stiffeners in larger panels
         4) Turned back edges
         5) Data pocket
      d. All welds ground smooth
      e. Front free of waves and other imperfections
      f. Finish:
         1) Rust inhibitive primer
         2) Three finish coats, minimum
         3) Interior enclosure and subpanel color: White
         4) Exterior panel color: ANSI 61 gray polyester power coating over phosphatized surface, unless otherwise specified
         5) Instrument panel quality finish
   4. Manufacturers:
      a. Hoffman
      b. Weigman

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B. Free Standing Enclosures:

1. Materials:

    a. Front: 10 gage minimum steel plate
    b. Sides, tops, and doors: 10 gage steel
    c. Bases: Heavy channel iron

2. Rating:

    a. Indoor, controlled environment: NEMA 12, unless otherwise specified
    b. Indoor, corrosive environment: NEMA 4X, unless otherwise specified
    c. Outdoor: NEMA 4, unless otherwise specified
    d. Door Clamps: Stainless Steel

3. Fabrication:

    a. Dimensions as indicated on Drawings or as required for the equipment specified
    b. Indoor, protecting components from dust, dirt, oil and water
    c. Rigidly braced and reinforced to support instruments

4. Doors:

    a. Approximate full height of vertical section
    b. Heavy gage continuous hinge pin
    c. Positive 3-point latches
    d. Door and body stiffeners in larger panels
    e. Turned back edges
    f. Additional bracing as required for rigidity
    g. Data pocket

5. Knobs, handles, and other exposed hardware: Stainless steel

6. All welds ground smooth

7. Front free of waves and other imperfections

8. Base:

    a. Channel flanges up for anchoring web to floor
    b. Slotted bolt holes, 1-1/2 inches long for field adjustment
    c. Not recessed at base

9. Finish:

    a. Rust inhibitive primer
    b. Three finish coats, minimum
    c. Interior enclosure and sub panel color: White
    d. Exterior panel color: ANSI 61 gray polyester power coating over phosphatized surface, unless otherwise specified
    e. Instrument panel quality finish

10. Manufacturers:

    a. Hoffman (Division of Pentaire)
    b. Saginaw Controls
    c. Bud Industries

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C. Wiring:

1. Internal instrument and device wiring:

    a. Manufacturer's standard
    b. Analog: 18 American Wire Gauge (AWG) minimum, stranded copper, twisted, shielded, with drain.
    c. Digital and power: Sized for the current to be carried (14 AWG minimum), stranded copper, 600-volt, Type moisture and heat resistant thermoplastic (MTW)

2. Interconnecting wiring and wiring for external connections:

    a. Stranded copper, sized as shown in the Drawings or for the current to be carried (12 AWG minimum)
    b. 600 volts insulation
    c. Heat and moisture-resistant and flame-retardant non-metallic covering
    d. Flexible cable at hinges

3. Wiring grouped or cabled and firmly fastened to panel in vinyl wiring duct with snap-on covers. Ducts shall be sized for no more than 60 percent fill

4. All wiring identified with wire numbers as shown on the submittal Drawings.

5. Wiring protected from damage at hinges

6. Instrumentation power supply protected by fuse or circuit breaker, with fuse or circuit breaker easily accessible, and provided with isolation transformers and transient protection:

    a. Analog Signals:
        1) Manufacturers:
            a) EDCO; Model PC-642 or SRA-64
            b) M-SYSTEM; Model MDP-24-1
            c) Wieland; ModeI57.806.l153.0
    b. 120 V AC Lines
        1) Manufacturers:
            a) EDCO; Model HSP-121,
            b) M-SYSTEM; Model MH-105A (5 Amps), 110A (10 Amps), BOA (30 Amps)
            c) Wieland; Model WB.700.120

7. All analog or other DC circuits shall be separated by at least 6 inches from any parallel AC power or control wiring

8. Terminal blocks for panels, consoles, racks, and cabinets:

    a. Provide for external wiring:
        1) Power supply circuits
        2) Signal circuits
        3) Wire-through circuits
        4) Shielded cable shields
        5) 20 percent additional (4 minimum)
    b. Located 6 inches, minimum, above base of panel

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c. Terminal blocks shall be grouped to keep AC circuits separate from 24 volts DC circuits
d. Size all terminal block components to allow insertion of all necessary wire sizes and types and to accommodate current to be carried
e. Rail mounted, screw clamp compression type with marking strips and covers. Supply terminals that allow connection of wire without any preparation other than stripping
f. Suitable for 16 AWG to 12 AWG copper conductors:
g. Manufacturers:
1) Allen-Bradley; Model 1492-CAI
2) Square D; Model 9080
3) Entrelec; Model 115-116.07

9. Accessories:

a. Interior illumination:
1) Hand switch controlled compact fluorescent light
2) Toggle type light switch
b. A print pocket shall be provided mounted on the inside face of the panel door
c. All panels shall be provided with corrosion inhibiting capsules of a quantity appropriate to the panel volume

D. Device Identification: Per Section 16075

2.2 PANEL MOUNTED INSTRUMENTS AND DEVICES

A. Pilot Devices:
1. Round pilot devices:

a. Heavy duty, oil tight
b. Contacts, operator types, and lamp lens colors as indicated on Drawings
c. Lamps front replaceable
d. 120 volt lamps, or 24 to 28 volt lamps with individual transformers or resistors, push-to-test type
e. Contact rating; 10 amps, minimum at 120 volts AC
f. Manufacturer:
1) Allen-Bradley; Model 800T
2) Cutler Hammer; Model 10250T
3) Or equal

B. Relays and Timers:
1. 120 volts, 60 hertz coils for continuous duty in 40 degrees C ambient

2. 10 amperes, 120 volts AC contacts

3. Contacts, actions, ranges, and settings as indicated on Drawings

4. Auxiliary relays:

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a. Plug-in type relay
b. Din-rail mounted sockets
c. Sub panel mounted
d. Manufacturers:
    1) Allen-Bradley; Model 700 P
    2) Idec; Model Type RH
    3) Cutler Hammer; Model D5

C. Current Transformer:
1. Current to current transformer, UL recognized
2. 600 Volt classification
3. Size to be determined in the field
4. 0-to-5 A secondary, primary as shown in Drawings
5. Manufacturer:
    a. Square D; Model 4210
    b. Or equal

D. Power Supplies:
1. Modular, plug-in, DIN rail mountable
2. Solid state
3. Sized for continuous operation of all equipment plus 150 percent excess capacity
4. Input power: 120 volts AC, 60 hertz
5. Output power: As shown on the Drawings
6. Over current and overvoltage protection for power supply and all components of system
7. Manufacturers:
    a. Absolute Process Instruments; Model API 9046 series, 9046-24 (24 V DC at 75 mA)
    b. Sola/Hevi-Duty; Model SDN series, SDN5-24-100 (24 V DC at 5 Amps)
    c. Idec; Model PS5R series, PS5R-E24 (24 V DC at 4 Amps)

E. Isolation Transformers:
1. Input: 120 volts AC, 60 hertz
2. Output: 120 volts AC, 60 hertz
3. VA rating to be sized 50 percent greater than required load
4. Manufacturers:
    a. Sola/Hevi-Duty; Model MCR-63-23-21O-8 (120 V AC at 8 Amps)
    b. Stancor; Model GIS-1000 (120 V AC at 8 Amps)

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c. Tripp-Lite; Model IS-1000 (120 V AC at 8 Amps)

F. Uninterruptible Power Supplies (UPS):
1. Provide as indicated on the Drawings
2. Input: 120 V AC, 60 Hz
3. Output: 120 V AC, 60 Hz
4. VA sized 50 percent greater than required load
5. Power capacity sized at 60 minutes at full rated load
6. Manufacturers:
a. APC; Model Back-UPS
b. Sola/Hevi-Duty; Model S3000
c. Tripp-Lite; Model BC-PRO

2.3 FIELD MOUNTED FLOW MONITORING INSTRUMENTS AND DEVICES

A. Magnetic Flow Meter: Instrument Fl:
1. 300 psi pressure rating, 4 inch meter with digital indicator having a range of 0 to 1,140 gpm and equipped with a 9 digit totalizing reading unit of 1000 gallons and shall be accurate within 0.5% of actual flow. The meter shall operate within a range of 0.2 fps to 32 fps.
2. Meter tube sensor fabricated stainless steel pipe with 150 lb AWWA Class "D" flat face steel flanges. Internal and external meter tube shall be blasted and lined with NSF approved fusion bonded epoxy. Inside diameter shall offer no obstruction to flow. Electrodes shall be 316 stainless steel.
3. Signal Converter shall be pulsed DC coil excitation type with auto zeroing. The converter shall indicate direction of flow and provide a flow rate indication and a totalization of flow volume for both forward and reverse directions. Both forward and reverse totalizers shall be electronically resettable. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide galvanically isolated dual 4-20mA outputs. It shall be possible, in the test mode, to easily set the converter outputs to any desired value within the range. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display.
4. Four separate fully programmable alarm outputs shall be provided to indicate empty pipe, forward/reverse polarity (normally open/close), analog over-range, fault conditions, high/low flow rates, percent of range and pulse cutoff. The converter shall periodically perform self-diagnostics and display and resulting error messages. All set up and data and totalizer values may be protected by a password. The converter shall be integrally mounted our remotely mounted up to 500 feet from the sensor, and shall be supplied in a sealed IP67 rated enclosure. Calibration will be completed at the manufacturer's location in

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accordance with customer supplied application-based requirements.

5. Provided with all communication and power supply interconnecting cables for complete operating system

6. Manufacturers:

    a. McCrometer UltraMag

2.4 FIELD MOUNTED LEVEL MONITORING INSTRUMENTS AND DEVICES

A. Submersible Level Sensor L1:

1. Transmitter Unit:

    a. 2 Wire (4-22 AWG) PVC
    b. 4-20 mA DC Output
    c. Waterproof

2. Sensor:

    a. Stainless steel construction
    b. Narrow design suitable for 1 ½ stilling well
    c. Temperature output option

3. Provided with vendor furnished cable of suitable length for installation as detailed

4. Provided with optional cable hanger (P/N #12-90-0931)

5. Manufacturer:

    a. KPSI
    b. Model 750
    c. Or approved equal

B. Level SW: Instrument L2:

1. Sensor:

    a. Bracket mounting
    b. Slosh shield
    c. Copper/Nickel stem & mounting
    d. BUNA N float material

2. Electrical:

    a. NO/NC contacts as required for failsafe operation
    b. Switch contract rating: 50 VA
    c. Neoprene 18/2 cable with waterproof connection

3. Manufacturers:

    a. GEMS; Model LS-270
    b. Or approved equal

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2.5 FIELD MOUNTED PRESSURE MONITORING INSTRUMENTS AND DEVICES

A. Pressure Switches: Instrument PS1:
   1. Contacts rated 10 amperes at 120 volts AC
   2. Buna-N diaphragm
   3. Bottom pipe connection, except as indicated on Drawings
   4. Contact quantity, action, and hand reset requirement as indicated on Drawings
   5. Enclosures: NEMA 250-97, Type 4 Enclosures
   6. Range: As shown on instrument list
   7. Capable of withstanding momentary surges of 4times the maximum pressure setting, without damage or loss of accuracy of calibration
   8. Calibrated adjustment dial
   9. Fixed differential, except as indicated on Drawings
   10. Provide seal as shown on the drawings
   11. Manufacturers:
      a. United Electric
      b. Ashcroft
      c. Mercoid

B. Pressure Indicators (gauges): Instrument PG1:
   1. Stainless steel case
   2. 4-1/2 inch dial with suitable range,
   3. Phosphorous bronze Bourdon tube
   4. Corrosion resistant movement
   5. Adjustable steel pointer, 1% of full scale accuracy
   6. 1/2 inch NPT
   7. Liquid-filled
   8. Stainless Steel case and wetted parts
   9. Provide pulsation dampeners where required
   10. Provide seals where shown on the drawings
   11. Range: As shown on instrument list
   12. Manufacturers:
      a. Ametek: Model 540
      b. Wika: Model 716
      c. Ashcroft: Model 1010
      d. Or Approved Equal

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2.6 FIELD MOUNTED SPECIALTY DEVICES

A. Intrusion Door Switch
   1. Heavy Duty construction with tamper-proof
   2. Epoxy sealed
   3. Stainless steel armored cable
   4. Form C (SPDT) switch contacts
   5. Contact rating: 125mA @24VDC
   6. Manufacturer: Honeywell 968XTP or approved equal

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Provide testing of instrument panels and panel mounted devices and demonstrate performance.

B. Provide shop inspection and testing of all instrument panel devices

C. Notify the Project Engineer two weeks prior to shipment of panel

D. Make corrections as identified by the Project Engineer prior to shipment

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify all equipment in control loop or system is available and on-site prior to taking an existing loop out of service

B. Review the requirements of the installation to ensure that the changeover can be performed within the project constraints

3.2 INSTALLATION

A. Install all products per Manufacturer's recommendations and the Drawings:

B. Functional diagrams are intended to show the basic functional requirements of the control loops and systems and do not relieve the instrumentation supplier from the responsibility to provide a complete and functioning system

C. Provide signal converters and boosters as required

D. Panels:
   1. Install freestanding enclosures on 4 inch concrete housekeeping pads
   2. Install level and plumb.

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E. Calibration of Instruments:
   1. Notify the Project Engineer two weeks prior to calibrating instruments
   2. The Project Engineer shall determine if calibration procedures will be witnessed
   3. Perform calibration exactly as outlined in Manufacturer's printed instructions
   4. Check calibration at several points along instrument range
   5. Complete data entry on Instrument Calibration Record Sheet immediately after each step of calibration and obtain the Project Engineer's initials for each sheet
   6. Completed Instrument Calibration Record Sheets and Instrument Loop Record Sheets must be submitted prior to substantial completion

F. Control Loop Checkout:
   1. Perform control loop checkout in an organized fashion:
      a. Final elements should be first tested and verified
      b. Check loop from final element back to instrument cabinet, and/or control panel. Immediately record checkout data as it is verified on loop checkout sheet
      c. Verify loop operation at control cabinet or control panel
      d. The Contractor will demonstrate each working loop to the Project Engineer. The Project Engineer will confirm functional loops by initial on the loop checkout sheet

3.3 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Division 1.

B. Provide Manufacturer's field services for Work of this Section

C. Prior to start-up:
   1. Advise Contractor on installation
   2. Check, calibrate, and place equipment in operation
   3. Visit the job as often as required and spend as much time as necessary to insure compliance with specification
   4. Advise Contractor of necessary corrections for start-up

D. Start-up:
   1. Check each loop and demonstrate operation to the Project Engineer
   2. Complete Instrument Loop Record Sheets and obtain the Project Engineer's initials on each sheet
   3. Provide written directions to Contractor detailing all corrections necessary for proper operation
   4. Provide 8 hours preliminary instruction to plant personnel on operation of instrumentation and controls after conclusion of loop checks

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E. Follow-up and Training:
   1. As specified in Division 1.
   2. Check all corrections made since start-up and recalibrate instruments where changes have occurred
   3. Inspect all instrument and control loops with plant personnel, address operation and performance concerns
   4. Provide minimum of8 hours of training encompassing all equipment described in this section

3.4 INSTRUMENT CALIBRATION RECORD

A. Attached

3.5 INSTRUMENT LOOP RECORD SHEET

A. Attached

3.6 INSTRUMENT LIST

A. As indicated in the contract documents

END OF SECTION

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SECTION 15100 - PROCESS PIPE

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes all pressure, gravity, and chemical feed pipe, fittings, specials, and appurtenances.

B. Related Work Specified Elsewhere:
   1. Pipe Installation: SECTION 02535.
   2. DIVISION 11 EQUIPMENT.
   3. Process Valves and Accessories: SECTION 15105.

1.2 REFERENCES:

A. Applicable Standards:
   1. American Water Works Association (AWWA):
      a. C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. C110 - Ductile-Iron and Gray-Iron Fittings, 3 Inches through 48 Inches for Water and Other Liquids.
      c. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
      d. C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
      e. C150 - Thickness Design of Ductile-Iron Pipe.
      f. C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
      g. C153 - Ductile-Iron Compact Fittings, 3 in. through 24 In. for Water Service.
      h. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water Distribution.
      i. C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 Inch through 36 Inch.
      j. C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water, 4 Inch through 8 Inch.
      k. M23 - PVC Pipe-Design and Installation.
      l. M41 Ductile-Iron Pipe and Fittings.
   2. American National Standards Institute (ANSI):
      a. B16.1 - Cast-Iron Pipe Flanges and Flanged Fittings, Class 25,125,250 and 800.
      b. B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.
   3. American Society for Testing and Materials (ASTM):
      a. F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

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b. F794 - Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
c. F1803 - Polyvinyl Chloride (PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter.
d. D1784 -Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
e. D2241 -Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
f. D2774 -Practice for Underground Installation of Thermoplastic Pressure Pipe
g. ASTM D2321-Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
h. D3139 -Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals
i. D3034-TYPE PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
j. D3212-Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

4. International Organization for Standardization (ISO):
   a. ISO 8791-1 - Ductile iron pipes - External zinc based coating

1.3 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Submit the following for acceptance prior to fabrication:
   1. Pipe and joint details.
   2. Special, fitting, and coupling details.
   3. Laying and installation schedule.
   4. Specifications, data sheets, and affidavits of compliance for protective shop coatings and linings.
   5. Manufacturer's design calculations.

C. Certificates and Affidavits: Furnish the Following Prior to Shipment:
   1. Affidavit of compliance with applicable standard.
   2. Certificate or origin for all steel flanges. Flanges shall be manufactured in the USA.
   3. Test certificates.

1.4 QUALITY ASSURANCE:

A. Manufacturers shall be experienced in the design and manufacture of pipe, fittings, specials, or appurtenances for a minimum period of 5 years.

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B. All pipe manufactured to AWWA C-200 series specifications shall be furnished by a manufacturer certified by the Steel Plate Fabricators Association (SPAA) for steel pipe fabrication.

1.5 DELIVERY, STORAGE AND HANDLING:

A. As specified in SECTION 02535.

PART 2 PRODUCTS

2.1 PIPE REQUIREMENTS:

A. Furnish pipe of materials, joint types, and sizes as indicated or specified.

B. Pipe shall withstand all stresses resulting from external loads and internal pressures. Pipe and gasket materials shall be compatible with the fluid to be conveyed within the pipe.

C. Pipe Marking: All pipe and fittings shall be marked conforming to the applicable standard specification under which the pipe is manufactured and as otherwise specified.

2.2 DUCTILE-IRON PIPE:

A. Design and Manufacture of Pipe:
   1. Ductile-iron pipe shall conform to AWWA C1l5, C150 and C151 except as otherwise specified.
   2. Pressure Class 350.
   3. All pipe joints and fittings shall have mechanical joint restraint.
   4. With laying condition Type 4 for ductile iron for load requirements.

B. Dimensions: See Construction Drawings.
   1. The minimum thickness as defined by pressure class for mechanical, flanged or push-on type joint ductile-iron pipe shall be per Pressure Class 350.
      a. Minimum thickness for ductile-iron pipe threaded for screw-on flanges shall be in accordance with AWWA C115.
      b. Pipe with grooved barrel for any type of restrained joint shall have wall thickness increased to provide a minimum wall thickness conforming to AWWA C606.

C. Joints:
   1. Mechanical and Push-On Type:
      a. Provide mechanical or push-on-type joints for all buried pipe less than 30 inches in diameter unless otherwise specified or indicated.
      b. Joints shall conform to AWWA C111.

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2. Flanged:

   a. Provide flanged joints for all interior pipe except where otherwise specified or indicated.
   b. Flanges for pipe shall be ductile iron and conform to the applicable provisions of AWWA C110 and C115 and shall be drilled ANSI B16.1 Class 125.
   c. Pipe with victaulic-style couplings and rigid joints conforming to AWWA C606 may be substituted for Class 125 flanged pipe where indicated or approved by Engineer.

3. Sleeved or Coupled:

   a. Provide for sleeves or couplings where indicated.
   b. Furnish pipe ends suitable for receiving style of sleeve or coupling indicate specified.
   c. Provide anchored couplings where restraint is required to withstand specified operating or hydrostatic test pressure and where indicated.

4. Restrained:

   a. Furnish where joint restraint is required to offset internal pipeline forces.
   b. Provide restrained joints of following approved types:
      1) Restrained mechanical joint.
      2) Anchored couplings.
   c. Mechanical joint retainer glands shall not be used where joint restraint is required unless indicated. When indicated, retainer glands shall be Megalug manufactured by EBAA Iron, Inc.

D. Fittings:

1. Fittings shall conform to AWWA C110 or C153 and shall have a pressure rating of not less than that specified for pipe.

2. Fittings shall be ductile iron.

3. Fittings for pipe with mechanical joint shall have mechanical joints.

4. Fittings for pipe with push-on joints shall be mechanical joint or push-on-type joint.

5. Fittings for pipe with grooved type joint shall have cut grooved type rigid joints per AWWAC606.

6. Include all specials, taps, plugs, flanges, and wall fittings as required.

7. Provide openings for air valve, drain, sampling, sensing, testing, and other connections with threaded bosses or flange outlets sized and located where indicated.

8. Provide tangent blow-off and drain assemblies where indicated. Outlet size shall 150 mm (6 inches) and have flanged end.

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E. Lining:
1. All pipe and fittings shall be cement-mortar lined in accordance with AWWA C104.

F. Coating:
1. All ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8791. The mass of the zinc applied shall be 200g/m^2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc.
2. All iron fittings shall be coated with manufacturer's standard bituminous paint coating.
3. Flange faces shall be coated in accordance with AWWA C115.

2.3 PVC PIPE:

A. Perimeter Drain:
1. ASTM D3034, SDR-35 and ASTM F679
2. Perforated, with two rows of holes ½ in diameter on 5 inch and 120° angle apart

B. Electrical Conduit:
1. ASTM D1784 Schedule 80 PVC

C. Dimensions: See Pipe Summary Table, Construction Drawings.

D. Minimum pipe stiffness, when measured at 5% deflection, shall be as follows:
1. 46 psi for ASTM D3034.
2. 46 psi for ASTM F679 pipes.
3. 46 psi for ASTM F794 pipes.
4. 46 psi for ASTM F1803 pipes.

E. Joints:
1. Compression-type with the elastomeric ring gasket confined in the annular space between the bell end or socket and the spigot end of pipe.
2. Elastomeric gasket ring joints shall conform to the requirements of ASTM D3212 or higher. Gaskets shall be synthetic rubber material made in conformance with ASTM F477.
3. Push on type per ASTM D3212 and F477 with internally cast bell with one sealing ring. Designed to hold pipe in alignment, provide flexibility, separate the ends of pipe lengths, resist applied earth pressures, and provide fluid tightness. Rubber rings: ASTM D3212 and F477. Or PVC sleeve and 2 sealing rings.
4. Plain end of pipe shall be marked with a reference line to facilitate assembly inspection.
5. Fittings: Tee or wye connections shall be suitable for assembly to 4-inch or 6-

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inch house or building sewers.

6. Reducing-branch tee or wye fittings with elastomeric-gasket joints same as pipe. Service line connection shall be bell-end with an elastomeric ring-gasket and a minimum wall thickness of SDR-35.

7. Saddle-type fittings with an elastomeric ring-gasketed bell-end service connection and minimum wall thickness of SDR-35. Saddle-type fitting to be supplied with a rubber sealing gasket and stainless steel straps for connection to pipe.

8. Furnish permanent plugs for future service line connections and testing.

F. Connections: Furnish any special flexible couplings required for manhole tie-ins or connections to other rigid structures.

G. Inspection and Testing:
1. Primarily by manufacturer's testing lab and quality control personnel.
2. Perform to avoid, insofar as possible, delivery of defective pipe.
3. May be witnessed by Owner, Engineer, or approved independent testing laboratory.
   a. Independent testing laboratory, when used, shall be retained by Owner at no expense to Contractor.
   b. Contractor and manufacturer shall cooperate with Owner's inspection and test personnel. Permit unrestricted access, furnish reasonable space and facilities, and provide 5 working days advance notice of test schedule.
4. Contractor shall provide 3 copies each of certified test reports to Engineer.
   a. Include stiffness and deflection, dimension, and hydrostatic joint tests per ASTM D3034, D3212, and F679.
   b. Furnish prior to delivery.

H. Handling and Delivery:
1. Do not deliver until tests on representative specimens have been performed.
2. Use equipment and methods adequate to preserve quality of pipe and to protect joint elements.

2.4 SLEEVES AND COUPLINGS:

A. Sleeves:
1. AWWA C110 mechanical joint ductile-iron solid split transition sleeve type:
   a. Pipe end space shall not exceed one-third of the sleeve laying length.
   b. Interior, exposed, exterior, or buried service as indicated.

B. Couplings:
1. Center sleeve and compression gland-type end ring conforming to AWWA

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C219.

2. Center sleeve shall be without pipe stop.

3. Couplings for joining steel pipe shall be steel.

4. Couplings for joining direct buried, exposed exterior, vault or pit installations of iron, or PVC pipe up to 12-inch diameter shall be iron. Provide lined and coated steel couplings for larger pipe diameters.

5. Couplings for exposed interior iron or PVC pipe may be steel or iron.

6. Fastener bolts shall be ductile iron or stainless steel for iron couplings and high-strength, low-alloy steel for steel couplings. Bolts for direct buried coupling installations shall be stainless steel.

7. Center sleeve and end rings shall be:

   a. Ductile or malleable iron for iron couplings.
   b. Steel for steel couplings.

8. Lining and Exterior Coating:

   a. Use for all steel couplings intended for direct bury, exposed exterior, vault or pit installations.
   b. Completely coat center sleeve and end rings.
   c. Two-part epoxy or nylon fuse-coated to a minimum 10 mils thickness.
   d. Line interior of all steel couplings intended for exposed-interior installations. Coat exterior with normal shop coating.

C. Flanged Coupling Adapters:

1. Flanged end and body to be one unit conforming to AWWA C219. Coupling end to be compression gland type with follower ring.

2. Adapters for joining direct buried, exposed exterior, vault or pit installations of iron pipe shall be iron.

3. Adapters for joining exposed interior iron pipe may be steel or iron.

4. Flanged end bolt circle, bolt size, and spacing shall conform to the applicable provisions of ANSI B16.1 and shall be drilled Class 125 for iron adapters. Flanges on steel adapters shall be AWWA C207, Class D, drilled ANSI B16.1 Class 125.

5. Bolts and nuts shall be ductile iron for iron adapters and high-strength, low-alloy steel for adapters.

6. Anchor studs shall not be used where joint restraint is required. Furnish adapters with the rod harness assemblies where indicated.

7. Lining and Exterior Coating for Steel Adapters:

   a. Two-part epoxy or nylon fuse-coated to a minimum 10 mils thickness.
   b. Completely coat adapter sleeve and end follower gland plus line interior for adapters intended for exposed exterior, vault or pit installations.

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c. Line interior of all adapters intended for exposed interior installations. Coat exterior with normal shop coating.

D. Anchored Couplings:
1. Furnish where joint restraint required to offset internal pipeline forces.
2. Provide harnessed sleeve couplings and flanged coupling adapters with tie rod harnesses where indicated.
a. Harnesses shall consist of lugs or clamps welded or otherwise securely fastened to opposite joint elements with tie bolts between opposing lugs. "Dog ear" lugs shall be fabricated as indicated.
b. Design of harnesses for steel pipe shall conform with applicable provisions AWWA M11.
3. Provide expansion couplings with limit rods.
4. Provide couplings for grooved and shouldered type joints conforming to AWWA C606.
a. Furnish grooved ends on ductile-iron end pipe.
b. Furnish shouldered ends on steel pipe.
5. Mechanical joint retainer glands shall not be used where joint restraint is required unless indicated. When indicated, retainer glands shall be Megalug manufactured by EBBA Iron, Inc. for ductile iron or PVC pipe Depend-O-Lok may be used for steel pipe.

E. Insulated Couplings:
1. Couplings shall be insulated to prevent electrical conductivity where indicated.
2. Insulated coupling design shall be otherwise conforming to the standard types and' specified.

F. Flexible Couplings:
1. Flexible couplings for chemical feed systems shall be Proco Series 261R with hypalon material.
2. Flexible couplings for all other process applications shall be Proco Series 240 with neoprene material.

2.5 GASKETS AND BOLTING MATERIALS:

A. Provide all gaskets, bolts, lubricant, and other accessories required to install pipe, fittings, and specials complete and ready for service.

B. Gaskets for flanged joints shall conform to ANSI B16.21,1/8-inch thick full-face synthetic rubber or American Cast Iron Pipe Company Toruseal 1/8-inch thick full-face gasket or U.S. Pipe Company Flange-Type 1/8-inch thick ring gasket. Provide full-face gaskets for all pump and equipment connections.

C. Gaskets for ductile iron flanged pipe and fittings 12 inch and smaller shall have "nominal" inside diameters, not the larger inside diameters per ANSI B16.21.

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D. Bolts for flanged joints shall conform to ASTM A307, Grade B. Nut and bolt heads shall be hexagonal. Gaskets and bolts for other than flanged joints shall be as otherwise specified for pipe and pipe joints.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Specified in SECTION 02535.

3.2 FIELD TESTING:

A. Specified in SECTION 02535.

END SECTION 15100

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SECTION 15105 - PROCESS VALVES AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY:

A. This Section includes all valves and accessories for process and tank systems.

B. Related Work Specified Elsewhere:
   1. Pipe Installation: SECTION 02535.
   2. DIVISION 11: EQUIPMENT
   3. Process Piping: SECTION 15100
   4. DIVISION 16: ELECTRICAL

1.2 REFERENCES:

A. Applicable Standards:
   1. American National Standards Institute (ANSI):
      a. B16.1 - Cast-Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
   2. American Society for Testing and Materials (ASTM):
      a. A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
      b. A276 - Stainless and Heat Resisting Steel Bars and Shapes.
      c. A536 - Ductile Iron Castings.
      d. A564 - Hot-Rolled and Cold-Finished Age-Hardening Stainless and Heat Resisting Steel Bars and Shapes.
   3. American Water Works Association (AWWA):
      a. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
      b. C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 Inch Through 144 Inch (100 mm through 3600 mm).
      c. C500 - Metal-Seated Gate Valves for Water Supply Service.
      d. C504 - Rubber-Seated Butterfly Valves.
      e. C508 - Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS.
      f. C512 - Air-Release, Air / Vacuum, and Combination Air Valves for Waterworks Service.
      g. C540 - Power-Actuating Devices for Valves and Sluice Gates.
      h. C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
      i. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
      j. C606 -Grooved and Shouldered Joints.
   4. National Fire Protection Association (NFPA):
      a. 1963 - Screw Threads and Gaskets, Fire Hose Connections.

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5. Manufacturers Standardization Society (MSS):

a. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

1.3 SUBMITTALS:

A. Submit as specified in DIVISION 1. Include, but not limited to, the following:
1. Catalog data or illustrations showing principal dimensions, weights, sizes, parts, end connections, and materials.

2. Spare parts list referenced to illustration of parts.

3. Assembly and disassembly or repair instructions.

4. Dimensions of the clearance required for butterfly valve discs.

B. Certificates and Affidavits: Furnish prior to shipment. Include the following:
1. Test certificates.

2. Affidavit of compliance with applicable AWWA Standard.

1.4 QUALITY ASSURANCE:

A. Manufacturers shall be experienced in the design and manufacture of specific valves and accessories for a minimum period of 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Ship all valves with suitable end covers to prevent entrance of foreign material into valve body.

B. Protect valve threads, flanges, stems, and operators from damage.

C. Ship valves 2-1/2-inch and larger to the Project Site tagged with the valve number shown on the Drawings. Tag smaller valves to show the piping system in which it is to be used.

1.6 RESPONSIBILITY:

A. Actuators, their controls, and accessories shall be the responsibility of the valve manufacturer for sizing, assembly, certification, field testing, and any adjustments necessary to operate the valve as specified.

PART 2 PRODUCTS

2.1 RESILIENT-SEATED GATE VALVES:

A. Acceptable Manufacturers:
1. American Cast Iron Pipe Company.

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2. Chapman Division, Crane Company.
3. Clow Corporation.
4. Kennedy Valve, Division of McWayne, Inc.
5. M&H Valves, Dresser Industries, Inc.
6. Mueller Company.
7. Smith Valve, U.S. Pipe & Foundry Company.
8. Or Approved Equal

B. Design:
1. Conform to AWWA C500 and as specified.
2. All stem seals shall be double O-ring type.

C. Actuators:
1. All valves shall open counterclockwise.
2. Non-rising Stem.

D. Interior Coating:
1. Conform to AWWA C550.
2. Apply to all interior ferrous metal surfaces.

E. Testing:
1. Testing shall be performed conforming to AWWA C500.
2. Furnish affidavit of compliance.

2.2 BUTTERFLY VALVES (AWWA-RATED):

A. Dimensions and Design:
1. 8” AWWA Class 150B
2. Conform to AWWA C504 and as specified.
3. ANSI/NSF Standard 61 approved for drinking water system components.
4. Suitable for type of installation specified.
5. Flanged with Open/Close Electric Actuator

B. Acceptable Manufacturers:
1. Valmatic
2. Or Approved Equal

C. Design:
1. The valve shafts shall be of the through-type for sizes 3”-24”. Shafts shall be locked to the disc by O-ring sealed taper pins retained with stainless steel nuts.

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2. The valve Discs shall be of the solid type without external ribs or vanes to obstruct flow.

3. Resilient seats shall be located on the valve disc and shall provide a 360° continuous, uninterrupted seating surface. Seats shall be mechanically retained with a stainless steel retaining ring and stainless steel Nylok® cap screws which shall pass through both the resilient seat and the retaining ring. The retaining ring shall be continuous or investment cast with overlapping sections, serrated grooves, and shoulders providing a Tri-Loc® system. The resilient seat's mating surface shall be to a 360° continuous, uninterrupted stainless steel body seat ring. Resilient seats shall be field adjustable and replaceable and shall not require epoxy, syringes, needles or pressure vessels to replace or adjust.

4. The sleeve bearings shall be provided in the valve hubs and shall be self-lubricating nylatron or teflon lined, fiberglass backed.

5. The shaft seals shall be of the V-type and shall be replaceable without removal of the valve from the line or the shaft from the valve.

D. Connections:
   1. Flanged end connections shall conform to ANSI B16.1, Class 125 for cast-iron body or AWWA C2017 Class B. Flanges shall be flat faced.

E. Materials and Construction.
   1. Body: Class 150B valve bodies shall be ASTM A126, Class B gray iron or ASTM A536 Grade 65-45-12 ductile iron.

   2. Disc: Valve disc shall be ASTM A536 Grade 65-45-12 ductile iron.

   3. Shafts: Shafts shall be ASTM A276 Type 304, or ASTM A564, Type 630 Stainless Steel.

   4. Seat: Resilient seat shall be Buna-N and mate to a Type 316 Stainless Steel body seat ring.

   5. Hardware: All seat retaining hardware shall be Type 316 stainless steel.

F. Actuators:
   1. Electric Actuators.
      a. Provide factory-mount actuators conforming to AWWA C540 for open-close service to operate on 120V, single phase power including the primary metered valve.
      b. Motor shall be as specified in DIVISION 16.
      c. Actuator shall move disc from fully-open to fully-closed position, or reverse, in approximately 30 seconds. Provide indicator to show position of disc.
      d. Products of the following manufacturers shall be acceptable:
         1) Auma Actuators, Inc.

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e. Butterfly valves shall utilize the limit switches provided by the valve manufacturer. The settings of these limit switches shall be set by the valve manufacturer's representative as per the Engineer.

f. Motor actuators shall be furnished in accordance with AWWA C542 for Power Actuators and factory tested on the production valve. The motor actuator assembly shall be designed for open/close service with a minimum operating time of 30 sec. The motor unit shall be furnished with a position indicator, independently adjustable, 15-amp limit switches, and adjustable torque sensors to protect the valve indicator. A handwheel with a declutch lever shall be provided so that the handwheel does not rotate during electrical operation. Motors shall be sized with a 1.5 safety factor and a power supply of 120V, single phase, 60 Hz AC.

G. Coating:

1. The valve exteriors for above ground service shall be coated with a fusion bonded, alkyd primer. Valve exteriors for buried service shall be coated with an epoxy coating.

2. Valve interiors shall be coated with an NSF/ANSI 61 epoxy coating approved for potable water. Fusion bonded epoxy shall be supplied on the exterior and interior when specified.

2.3 SWING FLEX CHECK VALVES (INLINE APPLICATIONS):

A. Acceptable Manufacturers:

1. Valmatic Valve & Manufacturing Corp.

2. Or Approved Equal

B. Design:

1. Conform to AWWA C508 and as specified.

2. The Check Valve shall be of the full body flanged type, with a domed access cover and only one moving part, the flexible disc.

3. The valve body shall have a full flow equal to nominal pipe diameter at all points through the valve.

4. The top access port shall be full size, allowing removal of the disc without removing the valve from the line.

5. The disc shall be of one-piece construction, precision molded with an integral O-ring type sealing surface, and contain steel and nylon reinforcement in the hinge.

6. The valve body shall be constructed of ASTM A126, Class B cast iron.

C. Materials and Construction.

1. Body shall be cast iron. Flanges shall be ANSI B16.1, Class 125.

2. Valve disc shall be rubber-faced cast iron precision-molded Buna-N (NBE),

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ASTM D2000-BG.

3. Suitable for 150 psi operating pressure.

2.4 VALVE BOXES:

A. Acceptable Manufacturers:
   1. Tyler Company.
   2. Or Approved Equal.

B. Provide for all buried valves.

C. Design:
   1. Boxes shall be two-piece cast-iron slip type with 5-l/4-inch shaft adjustable as required for the project.
   2. Boxes shall consist of a cast-iron cover, lid, and base castings with 6-inch ductile-iron pipe shaft. No slip type boxes will be allowed.
   3. Provide extension stem to bring operating nut within 2 feet of valve box top.
   4. Drop cover shall be marked "WATER."

2.5 FIRE HYDRANTS:

A. Acceptable Manufacturers:
   1. Mueller Company, model Super Centurion A-423.

B. Design:
   1. Conform to AWWA C502 and as specified.
   2. Provide compression type main valve designed to open against pressure. Valve facings shall be of nontoxic materials suitable for potable water service.
   3. Provide internal main valve seat opening of not less than 5 inches diameter.
   4. Design to open counterclockwise.
   5. Provide dry-type bonnet with lubricant reservoir protected by O-or Quad-ring seals
   6. Provide mechanical joint bell on shoe.
   7. Furnish for minimum bury depth of 8 feet. Include extensions as required for blow-offs.
   8. Furnish with two 2½ inch hose nozzles and one 4 ½ inch pumper nozzle with NFPA 1963 standard threads. Nozzle caps shall be chained to hydrant.
   9. Provide traffic break-off joint located above and near ground surface designed to minimize accident repairs.

C. Shop Painting:
   1. Shop paint exterior of hydrants per manufacturer’s standard.

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2. Interior Coating:

a. Conform to AWWA C550.
b. Apply to exposed interior ferrous metal surfaces.

2.6 PLUG VALVE:

A. Acceptable Manufacturers:
1. Valmatic 5800R
2. Pratt: Ballcentric standard
3. Or Approved Equal

B. Design:
1. Body: and plug: Ductile iron, ASTM A536 Grade 65-45-12 or cast iron, ASTM A126, Class B
2. Plug facing: Nitrile Butadiene (Buna-N or Hycar), 70 durometer hardness except EPDM for plug valves in Biosolids piping
3. Seat: Welded-in nickel overlay of pure nickel (90% minimum), machine faced
4. Stem seal:

a. Buna-N multiple v-ring with adjustable gland
b. Buna-N Dual V-cup
c. EPDM self-lubricating packing ring

5. Thrust washers: PTFE or Stainless Steel
6. Upper and lower trunions bearings: Sleeve type, type 316 stainless steel, permanently lubricated
7. Ends to match connecting piping:

a. Flanged, 125 lb, ASME B16.1
b. Mechanical joint, AWWA C111

8. Maximum working pressure:

a. 175 psig, 4 inch through 12 inch
b. 150 psig, 14 inch through 36 inch

2.7 OUTLET CHECK VALVE:

A. Acceptable Manufacturers:
1. Tideflex Technologies Waterflex WF-1 Series
2. Or Approved Equal

B. Design:
1. The valve allows flow out of the reservoir during draw cycles and prevents flow into the reservoir during fill cycles.
2. Valve size shall match pipe diameter.

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3. The outlet flow valves shall be perforated disc type with elastomeric membrane.

4. The valves shall be NSF61 Certified. NSF61 approved/Certified materials will not be accepted in lieu of valve certification.

5. The perforated disc shall be fabricated of stainless steel plate with welded support gussets. The disc shall be flanged and drilled to mate with ANSI B16.1, Class 125/ANSI B16.5 Class 150 flanges. The disc shall have three (3) tapped holes used for fastening the membrane and support rod to the disc with stainless steel bolts, nuts, and lock washers. The top of the disc shall be tapped and supplied with lifting eyebolt for installation.

6. The membrane shall be circular, one piece rubber construction with fabric reinforcement. The diameter of the membrane shall allow adequate clearance between the membrane O.D. and the pipe I.D. The membrane shall be vulcanized with a specified convex radius to produce a compression set to allow the membrane to seal against the perforated disc at low reverse differential pressure.

7. The support rod shall be stainless steel and drilled with three (3) longitudinal holes to allow fastening of rod to membrane and perforated disc.

8. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the membrane to open, allowing flow to pass through the perforations in the disc. When backpressure exceeds the line pressure, the membrane seats on the perforated disc preventing backflow.

9. The elastomer used in construction of the membrane must have been tested by an accredited independent laboratory that confirmed there is no degradation in the elastomer when exposed to chlorine and chloramine per the ASTM D471-98 "Standard Test Method for Rubber Property – Effect of Liquids."

2.8 INLET CHECK VALVE:

A. Acceptable Manufacturers:
   1. Tideflex Technologies Tideflex Check Valve 35-1 Series
   2. Or Approved Equal

B. Design:
   1. Duckbill-style check valves that allow fluid to enter the reservoir during fill cycles and prevent flow in the reverse direction through the nozzle during draw periods. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the bill of the valve open, allowing flow to pass. When backpressure exceeds the line pressure, the bill of the valve is forced closed.
   2. Valve size shall match pipe diameter.
   3. Check Valves are to be all rubber and of the flow operated check type with a flanged end connection. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The flange and flexible duckbill sleeve shall be one piece rubber construction with

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nylon reinforcement. The bill portion shall be thinner and more flexible than the valve body, and formed into a curve of 180°.

4. Flanged End. The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards. The valve shall be furnished with galvanized or stainless steel back-up rings for installation.

5. Opening pressure, backpressure, pressure rating, headloss and flow data shall be appropriate for the application.

2.9 OVERFLOW AND DRAIN CHECK VALVE:

A. Acceptable Manufacturers:
   1. Tideflex Technologies Tideflex Check Valve 35-1 (flat bottom) Series for applications where the outlet is near the bottom of a structure
   2. Tideflex Technologies Tideflex Check Valve 35 (flared top and bottom) or 35-1 (flat bottom) Series for applications where the outlet is not near the bottom of a structure

B. Design:
   1. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the bill of the valve open, allowing flow to pass. When backpressure exceeds the line pressure, the bill of the valve is forced closed.
   2. Valve size shall match pipe diameter.
   3. Check Valves are to be all rubber and of the flow operated check type with a flanged end connection. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The flange and flexible duckbill sleeve shall be one piece rubber construction with nylon reinforcement. The bill portion shall be thinner and more flexible than the valve body, and formed into a curve of 180°.
   4. Flanged End. The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards. The valve shall be furnished with galvanized or stainless steel back-up rings for installation.
   5. Opening pressure, backpressure, pressure rating, headloss and flow data shall be appropriate for the application.

2.10 MIXER:

A. Acceptable Manufacturers:
   1. PAX Water Technologies (Richmond, California) or pre-approved alternate.

B. Design:
   1. PAX Model PWM100.
   2. Mixing system shall completely mix reservoir according to the following minimum performance requirements. These requirements can be measured and validated after installation by operators with readily-available tools such as

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temperature probes and total chlorine grab samplers.

a. Temperature Uniformity: For tanks up to 375,000 gallons in volume: All temperatures shall converge to within 0.50°C within 24 hours after mixer is installed and activated.
b. Disinfectant Residual Uniformity: For tanks up to 375,000 gallons in volume: Disinfectant residual within top five feet of tank and bottom five feet of tank will converge to within 0.20 ppm within 24 hours after mixer is installed and activated. During continuous operation of the mixer, disinfectant residual will converge to within 0.20 ppm at least once every 24 hours.

3. Mixer operation shall be independent of tank drain and fill cycles to ensure constant mixing.

4. Mixer shall weigh less than 40 pounds (~18 kg) and be able to be hoisted, installed, and/or removed by on-site personnel without additional equipment needed, and so that there is no crush hazard or entanglement hazard present, and so that weight of mixer on tank floor does not cause damage to interior coating.

5. Mixing system inlet shall be elevated at a minimum of 6 inches above tank floor to avoid disturbing accumulated tank sediment or entraining particles and causing accelerated wear of moving parts.

6. Power source for mixer shall be 115VAC single phase grid power to allow unit to continue 24/7 operation.

C. Construction

1. Components – wet-side: shall be NSF/ANSI Standard 61 certified.

2. Equipment entering tank shall not adhere to, scratch or otherwise cause damage to internal tank coating or put undue stress on the materials of the tank construction. Equipment shall fit through a standard hatch of size 18” x18” or larger. UTILITY may prefer to puncture side-wall or ceiling of tank (in place of penetrating the hatch-way) to allow motor cable entry into the tank and protection against freezing/ice damage.

3. Each submersible mixer shall consist of the following components:

a. Nozzle: AISI Type 316 Stainless Steel
b. Motor: Stainless Steel 304 body, Chlorine/Chloramine resistant rubber seals, Fully submersible

4. Power: Signal Phase 115VAC or 230VAC configurations: Component – On/Off Safety Disconnect Switch with indicator light.

D. Controls

1. Each unit shall be equipped with all necessary controls, inter-wired, to provide the following minimum functions:

a. a. On/Off switch to control power to mixer.
b. Any other controls shown on electrical and instrumentation drawings

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PART 3 EXECUTION

3.1 INSTALLATION:

A. Comply with provisions of AWWA C600 and as specified.

B. Thoroughly clean and remove all shipping materials prior to setting. Operate all valves opened to totally closed.

C. Equip with anchorage where indicated.

D. Install valves with stems pointing up, and as close to vertical as possible.

E. Install valves at each piece of equipment, fixture or appliance so that the supply and return services can be shut off to remove the item without draining the remainder of the piping system.

F. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping.
   1. Locate valves so as to be accessible.

G. Isolation valves shall not be used for balancing and balancing valves shall not be used for isolation.

H. Provide drain valves at main shut-off valves, low points of piping and apparatus.

I. Provide separate support where necessary.

J. Do not allow meter connections of balancing valves to point downward.

K. Install valves so bypass valves are accessible.

L. Valves for isolating sections of piping systems shall be removed. It should be possible to isolate separate floors, separate wings, toilet rooms, machinery rooms and other natural subdivisions of the buildings.

M. Valves for isolating equipment and fixtures shall be provided. Valves (with strainers) shall be placed on both sides to permit component removal. Typical equipment includes pumps, coils or heat exchangers, temperature control valves, pressure reducing valves, steam traps, condensate receivers, etc.

N. If equipment is close coupled with other equipment over a short distance, then isolation valves may be placed on the upstream and downstream sides of the components and the valves in between deleted.

O. For mixers, install per manufacturer's instructions and recommendations.

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3.2 FIELD PAINTING:

A. Surface preparation and finish painting per manufacturer's requirements.

3.3 FIELD TESTING:

A. Perform on piping and valves as specified in SECTION 02535 and for the following:
   1. Gate valves.

END OF SECTION

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SECTION 16010 - ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 GENERAL CONDITIONS

A. The Instructions to Bidders, General Conditions, Special Conditions, Addenda, Alternates, these technical specifications and all drawings, together with the Bid and Agreement, comprise the Contract Documents. The Contractor shall examine all of these documents prior to submitting his or her Bid.

B. The Contractor is required to read carefully the specifications for all parts of the work so as to become familiar not only with the work covered by this Section, but also that of other Divisions and Sections, including all drawings.

C. The Contractor shall watch the progress of the work and report to the Engineer immediately any cases where ample space has not been provided to accommodate his work. He must not cut through any finished work until he has received permission from the Engineer. No claims for extra work will be allowed because of misinterpretation of Plans and Specifications or due to conflict between trades for useable space.

1.2 CONTENTS

A. Specified Herein: General requirements for electrical work.

B. Described herein are the following:
   1. Scope
   2. Quality Assurance, Standards and Symbols
   3. Fees and Inspection Certificates
   4. Materials
   5. Substitutions
   6. Electrical Drawings
   7. Coordination
   8. Sleeves, Inserts, Fastenings, Supports, Cutting and Patching
   9. Scaffolding
   10. Trenching and Backfilling
   11. Testing, Adjusting, Cleaning

1.3 SCOPE

A. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the

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work complete in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor without additional expense to the Owner.

B. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the Contractors bid, the same as if herein specified or shown. It is the intention of the Specifications and Drawings to call for finished work, tested, and ready for operation.

C. Prior to submission of bid, the Contractor shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, or rules; and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed the Contractor has included the cost of all required items in his proposal, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

1.4 QUALITY ASSURANCE, STANDARDS AND SYMBOLS

A. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards, utility company and fire insurance carrier's requirements. Contact proper authorities, obtain and pay for required permits, inspections and utility service connections. The Contractor shall pay for all temporary construction power necessary during the construction period.

B. In case of difference between the building codes, specifications, state laws, local ordinances, industry standards, utility company regulations, fire insurance carriers' requirements, and the contract documents, the most stringent shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.

C. Noncompliance: Should the Contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, fire insurance carriers requirements, and utility company regulations, he shall bear the cost arising in correcting any such deficiency.

D. Applicable codes and all standards shall include all state laws, local ordinances, utility company regulations and the applicable requirements of the following nationally accepted codes and standards:
   1. Building Codes
      a. 2012 International Building Code (or latest approved by the State of New Mexico)
      b. 2011 National Electrical Code (or latest approved by the State of New Mexico)
   2. Industry Standards, Codes, and Specifications
      a. ASHRAE - American Society of Heating, Refrigeration, and Air Conditioning Engineers
      b. ASME - American Society of Mechanical Engineers

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c. ASTM - American Society for Testing and Materials
d. EIA -Electronic Industries Association
e. IEEE - Institute of Electrical and Electronic Engineers
f. IPCEA - Insulated Power Cable Engineers Association
g. NEC - National Electrical, Code (NFPA No. 70-1996)
h. NEMA -National Electrical Manufacturers Association
i. NFPA - National Fire Protection Association
j. USASI - United States of America Standards Institute
k. UL -Underwriters Laboratories

3. Insurance Carriers

a. FIA - Factory Insurance Association
b. FMED - Factory Mutual Engineering Division

E. The Drawings are diagrammatic and indicate generally the locations of material and equipment. These Drawings shall be followed as closely as possible. The Contractor shall coordinate the work under this section with the structural, piping, and the drawings of other trades for exact dimensions, clearances and roughing-in locations. Contractor shall cooperate with all other trades in order to make minor field adjustments to accommodate the work of others. Do not rely on the scale of the drawings for rough-in measurements, nor use them as Shop Drawings.

F. All materials and equipment for which label service is available shall bear the label of the Underwriters' Laboratories Inc.

G. Guarantee: The Contractor shall guarantee his workmanship and material for a period of one year from the date of final acceptance and leave his work in perfect order at completion. Should defects develop within the guarantee period, this Contractor shall, upon notice of same, remedy the defects and have all damages to other work or furnishings caused by the defects or the work of correcting same repaired and/or replaced at his expense, to the condition before such damage.

1.5 FEES AND INSPECTION CERTIFICATES

A. The Contractor shall obtain and pay for all permits and inspection services and certificates in conjunction with this work.

B. Upon completion of the work, Contractor shall obtain the approval of all recognized agencies concerned with the work. Such certificates of inspection and approval from said bureau and/or agencies must be submitted to the Engineer and included in the Operation and Maintenance Manuals.

1.6 MATERIALS

A. Refer to Division 1 sections for general requirements for materials and equipment.

B. All materials shall be new, the best of their respective kinds, unless otherwise specified, and shall be installed by labor thoroughly skilled in the class of work anticipated

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C. Provide products which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work.

1.7 SUBMITTALS

A. Furnish the Engineer with complete shop drawings and associated data in accordance with the General Conditions and Specifications for all major elements of the electrical work for review, checking and approval. None of the following equipment shall be fabricated, delivered, erected or connected other than from drawings officially approved by the Engineer.

1. Panelboard
2. Lighting fixtures, lamps, ballasts, accessories, photocell, etc...

1.8 ELECTRICAL DRAWINGS

A. If directed by the Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

B. Electrical symbols used on this project are shown in a Symbol List on the accompanying working drawings. This list shows standard symbols and all may not appear on the project drawings; however, wherever the symbol on project drawings occurs, the item shall be provided and installed.

C. Conductor and conduit sizes are shown on the drawings in an equipment schedule for equipment and in the one line diagram for electrical distribution. Unless otherwise noted all other circuits shall be no less than 3/4" conduit with 2#12(CU,THWN) +1#12(CU,THWN) GND. In any case, minimum sizes for wire and conduit shall comply with all applicable codes.

D. Major equipment of the system is located on the floor plans and the interconnection conduit and wiring is included in the one line diagrams.

E. The drawings are indicative of the work to be installed, but do not show all bends, fittings, boxes and specialties required to complete the installation.

F. All conduits, wires, outlet boxes, switches, receptacles, devices and fixtures shall be included in the work.

G. Note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for complete systems.

H. Where it is stated that the contractor shall "provide" a device or piece of equipment, it shall mean that such devices or equipment are furnished and installed.

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1.9 COORDINATION

A. General: Refer to the General Condition and Division 1 sections for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the electrical work, and in its interface with other work including utilities and mechanical work, and that such establishment is the exclusive responsibility of the Contractor. Install the wiring and equipment at such times and in such manner as will in no way retard progress or completion of the project. Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 7'0" overhead clearance where possible. Locate operating and control equipment properly to provide easy access and arrange entire electrical work with adequate access for operation and maintenance. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).

B. The layout of wiring on the small scale drawings shall not be considered absolute. The design shall be subject to such revisions as may be necessary to overcome building obstructions. No changes shall be made in outlet locations without the written consent of the Engineer.

C. Examine the drawings and details for the placement of all outlets to properly coordinate them with relation to cabinets, piping, benches, structural panels, trims, moldings, etc. Examine all other shop drawings, catalog cuts, etc., for special apparatus which may be roughed in and to which connections must be made. Outlets, apparatus and connections thereto which are improperly located through failure to follow the above instructions, shall be subject to correction and/or relocation without extra charge to the Owner.

D. Coordination Drawings: For locations where several elements of electrical (or combined mechanical and electrical) work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual physical dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-coordination.

1.10 SLEEVES, INSERTS, FASTENINGS, SUPPORTS, CUTTING AND PATCHING

A. Contractor shall provide and install metallic supports as required for the proper installation of raceway systems and all other equipment installed under this division of the contract conforming to the latest edition of the NEC.

B. Conduit shall be supported on approved types of wall brackets, ceiling trapezes, strap hangers or pipe supports. All fastenings, supports, clamps and anchors, etc., shall be of type made for the purpose. For structural iron, use machine screws and for solid masonry use metallic expansion shields and machine screws. For wood or materials of similar fibrous nature, lag screws or bolts shall be employed. Screws with wooden

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plugs or anchors will not be accepted on any of the work. Studs and fasteners implanted in solid masonry by power actuated devices will be acceptable if precautions are taken to prevent spawling. The use of insulated wire or nylon wire ties shall not be acceptable as an attaching means for conduit or other equipment.

C. Conduit shall be securely fastened to all sheet metal outlets, junction and pull boxes with two galvanized locknuts and bushing, care being taken to see that the full number of threads project through to permit the bushing to be drawn tight against the end of the conduit, after which the locknuts shall be made tight sufficiently to draw them into firm electrical contact with the outlet box. Install a plastic bushing on end of conduits stubbed into ceiling spaces to protect cabling.

D. Contractor shall be responsible for all concrete pads, supports, piers, bases, foundations, and encasement required for the electrical equipment and conduit. The concrete pads for floor mounted electrical equipment shall be a minimum of 3" tall and six inches larger on all sides than the base of the equipment unless specifically indicated otherwise.

E. Obtain written approval of the Engineer before notching, boring, chipping, burning, drilling, and welding to structural members.

F. Furnish and install all sleeves which are required to protect equipment or which may be necessary to facilitate its installation. Sleeves used in conjunction with formed concrete shall be located where required and approved by the Engineer. Provide approved caulking for all conduit penetrations through walls, floors and ceilings.

G. Provide and install all inserts required for equipment. Inserts shall be cast iron or cast steel of slotted type to receive a machine bolt head or nut, after installation. Be responsible for the proper spacing of inserts and their alignment and preservation before and during construction.

H. All conduit and outlet installations and cutting of any kind must be done with great care so as not to leave unsightly surfaces which may not be entirely concealed by plates, escutcheons or other normal concealing construction. If such unsightly conditions occur, Contractor will be required, at his own expense, to replace the damaged construction.

1.11 SCAFFOLDING:

A. Furnish and erect all scaffolding, ladders, etc., required in the installation of wiring, equipment and fixtures.

1.12 TRENCHING AND BACKFILLING

A. Perform all trenching and backfill required by work under this division of the specifications. Trenching and backfilling shall be done in accordance with Division 2 of the specifications and as herein specified. Trenches shall be excavated to the depth

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required for the utilities involved. The trench bottom shall be graded true and free from debris, stones and soft spots. Direct burial cable shall not be allowed.

B. Refer to section 16075 for information regarding the marking of underground conduit with marker tape.

1.13 TESTING, ADJUSTING AND CLEANING

A. As soon as electric power is available and connected to serve the equipment in the building, and everything is ready for final testing and placing in service, a complete operational test shall be made in the presence of the Engineer. The Contractor shall furnish all necessary instruments and equipment and make all tests, adjustments, and trial operations required to place the system in balanced and satisfactory operating condition and he shall pay all professional engineering fees required in such testing. Data on all tests shall be submitted to the Engineer. Furnish all necessary assistance and instructions to properly instruct the Owner's authorized personnel in the operation and care of the system.

B. Prior to testing the system, the feeders and branch circuits shall be continuous from main feeders to main panels, to sub-panels, to outlets, with all breakers and fuses in place. The system shall be tested free from shorts and grounds.

C. The right is reserved to inspect and test any portion of the equipment and/or materials during the progress of its erection. The Contractor shall further test all wiring and connections for continuity and grounds before connecting any fixtures or equipment.

D. The Contractor shall test the entire system in the presence of the Engineer when the system is finally completed to insure that all portions are free from short circuits or ground faults.

E. The Contractor shall provide the Engineer with certification of the inspection and approval of an active member of the International Association of Electrical Inspectors of all work completed and included in the section. The Contractor shall be responsible for notifying the Inspector when work reaches inspection stage.

1.14 OPERATION AND MAINTENANCE MANUALS

A. Contractor shall prepare, assemble and submit Operation and Maintenance Manual in accordance with Section 01330 for the electrical system as installed.

B. Operation and Maintenance manuals shall be typed and bound in a hard cover, three ring binder or equivalent protection, and shall contain as a minimum the following:
   1. Shop drawings or catalog product literature of all material listed in Section 01330 - Submittals.
   2. Wiring diagrams and instructions for contactors, motor starters and time clocks.
   3. Control drawings for any systems not furnished under other contracts.

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4. Maintenance instructions for all equipment furnished under this contract.

5. Table of equipment listing motor starter sizes, overload sizes, and fuse sizes.

6. Table of light fixtures listing manufacture and model number; lamp type, manufacture and model number; ballast type, manufacture and model number.

7. A list of contacts with phone numbers for all systems for Owners= use, in the event the electrical system requires service work within the Warranty period.

8. Copy of Warranty Letter from Electrical Contractor and his appropriate sub-contractors.

END OF SECTION

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SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 THIS SECTION INCLUDES THE FOLLOWING:

A. Raceways.

B. Building wire and connectors.

C. Supporting devices for electrical components.

D. Electrical identification.

E. Cutting and patching for electrical construction.

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.3 COORDINATION

A. The Contractor shall be responsible for preparing coordination drawings, showing all work, in all areas. The Contractor shall be responsible for providing all labor and material, including but not limited to all fittings, hangers, control devices, lighting, low voltage equipment, cable tray, conduit, transformers, disconnects, etc., necessary to overcome congested conditions at no increase in contact sum. The Contractors base bid shall include any and all time and manpower necessary to develop such coordination efforts and drawings. Increased to contract sum or schedule shall not be considered for such effort.

B. The Contactor shall coordinate with the demolition of the existing plant equipment and controls, so that no process is shutdown prior to the new replacement process is running and tested.

C. Coordinate chases, slots, inserts, sleeves, and openings for electrical supports, raceways, and cable with general construction work.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

E. Coordinate electrical service connections to existing components owned by Owner. Verify location of existing underground electrical lines prior to trenching or excavation.

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F. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

1.4 COORDINATION DRAWINGS

A. Coordination drawings shall be prepared by the Contractor for his utilization and are his responsibility to assure systems will be installed in a manner to allow all systems to function properly.

B. Prepare and submit a set of coordination drawings showing major elements, components, and systems of electrical equipment and materials in relationship with other building components. Prepare 11”x17” drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for servicing and maintaining equipment. Indicate movement and positioning of large equipment into the building during construction.

C. Coordination drawings are informational submittals. Submit coordination drawings to Engineer for information only to document proper coordination of all portions of work and that coordination issues have been identified and resolved prior to submitting to the Engineer and prior to commencing construction in each affected area.

D. The review of the coordination drawings by the Engineer does not constitute a relief of responsibility of the Contractor or a change to the contract documents. The Contractor shall have sole responsibility in developing a fully coordinated and integrated ceiling cavity. Prepare floor plans, reflected ceiling plans, elevations, sections, and details to conclusively coordinate and integrate all installations. Indicate locations where space is limited, and where sequencing and coordination of installations are of importance to the efficient flow of the Work.

E. Prepare coordination drawings for specific equipment installations, including, but not limited to the following:
   1. Panelboards
   2. Equipment connections
   3. Control panels
   4. Motor disconnects and control.
   5. Ductbank feeder conduits

1.5 UTILITY COMPANY (KIT CARSON ELECTRIC COOPERATIVE) COORDINATION

A. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of Kit Carson Electric Cooperative.

B. Provide required connection for each new service to be provided to the project by Kit Carson Electric Cooperative. Conduits are to be provided to areas coordinated with

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Kit Carson Electric Cooperative with cabling and equipment by the Utility. Notify Engineer immediately if discrepancies are found.

C. Coordinate electrical utility interruptions one week in advance with the Owner and the Utility Company. Demolition of existing utility power to the site shall be so that duration of the interruption is kept to a minimum.

1.6 PROJECT CONDITIONS:

A. The contractor shall be required to attend a pre-bid walk-thru if required and shall make themselves familiar with the existing conditions. No additional costs to the Owner shall be accepted for additional work for existing conditions.

B. Field verify all existing conditions prior to submitting bids.

1.7 ELECTRICAL SUBMITTALS

A. Refer to the Conditions of the Contract (General and Supplementary), Division 1.

B. The submittals shall be submitted as a fully complete package identified by the specification section. Submittals that are not complete with the required information will be sent back to be corrected.

C. The Contractor shall identify any "long lead time" items which may impact the overall project schedule. If these submittal requirements affect the schedule, the Contractor shall identify the impacts and confer with the Engineer within two weeks of entering into the contract.

D. Submittals may be provided electronically. All electronic submittals need to be complete with all design information and stamped for conformity by the contractor. Any submittal not stamped or not complete will be sent back. Submittals that are submitted electronically will be reviewed, marked appropriately and returned by the same means received

E. Fire alarm and coordination drawings do not apply to the above. These drawings may be submitted in a separate submittal. Submittal shall be full size, hard copy drawings.

1.8 RECORD DOCUMENTS:

A. Refer to the Division 1 Section on Project Closeout or Project Record Documents for requirements. The following paragraphs supplement the requirements of Division 1.

B. Mark Drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details; Change Orders; concealed control system devices, and any other relevant deviations from the Contract Documents.

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C. Mark shop drawings to indicate approved substitutions; Change Orders; actual equipment and materials used.

D. Mark luminaire schedule on drawings to indicate manufacturer and complete catalog numbers of installed equipment.

E. Mark schedules including panelboard, mechanical, and similar equipment schedules on drawings to indicate installed equipment and materials used, and any deviations or revisions to electrical load data and calculations.

F. During construction, the contractor shall maintain at the job site a set of updated construction documents for the singular purpose of recording the above information. All record drawings shall be completed in erasable pencil. These changes shall be updated weekly.

PART 2 PRODUCTS

2.1 RACEWAYS

A. EMT: Electrical metallic tubing; ANSI C80.3, zinc-coated steel, with compression fittings.

B. FMC: Flexible metal conduit; zinc-coated steel.

C. LFMC: Liquid tight flexible metal conduit; zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

D. RMC: Rigid metal conduit; galvanized rigid steel; ANSI C80.1.

E. RNC: Rigid nonmetallic conduit, NEMA TC2, Schedule 80 PVC, with NEMA TC3 fittings, Schedule 40 PVC, type EB PVC for duct bank.

F. Raceway Fittings: Specifically designed for raceway type with which used.

2.2 WIRES, CABLES, AND CONNECTIONS

A. Conductors, No. 10 AWG and Smaller: Solid copper.

B. Conductors, Larger than No. 10 AWG: Stranded copper.

C. Insulation: Thermoplastic, rated 600 V, 75° C minimum, Type THHN/THWN, or USE depending on application.

D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.3 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating.

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B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

D. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

E. Expansion Anchors: Carbon-steel wedge or sleeve type.

F. Toggle Bolts: All-steel springhead type.

G. Powder-Driven Threaded Studs: Heat-treated steel.

2.4 ELECTRICAL IDENTIFICATION

A. Identification Device Colors: Use those prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape compounded for permanent direct-burial service, and with the following features:
   1. Not less than 6 inches wide by 4 mils thick.
   2. Embedded continuous metallic strip or core.

PART 3 EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

3.2 RACEWAY APPLICATION

A. Refer to the drawings for tables which define what is expected for this section.

B. Outdoor Installations:
   1. Exposed: RMC.
   2. Ductbank: RNC

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3. Underground: RNC.

4. Connection to Vibrating Equipment: LFMC.

5. Boxes and Enclosures: NEMA 250, Type 4X, unless otherwise indicated.

C. Indoor Installations (Note All Raceways Shall Be Concealed):

1. Within Block Walls: EMT

2. Exposed: RMC.

3. Below Slab on Grade: RNC or RMC where deflection with in slab could occur.

4. Connection to Vibrating Equipment: FMC; except in wet or damp locations: LFMC.

5. Boxes and Enclosures: NEMA 250, Type 4X; unless otherwise indicated. Fiberglass shall not be installed where exposed to sunlight.

3.3 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated.

B. Keep legs of raceway bends in the same plane and keep straight legs of offsets parallel.

C. Use RMC elbows where RNC turns out of slab.

D. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or woven polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wires.

E. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inches flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. All applications: Use single insulated conductors in raceway as permitted by applicable codes as interpreted by authorities having jurisdiction.

3.5 WIRING INSTALLATION

A. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

3.6 SUPPORT INSTALLATION

A. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers. Refer to drawing details.

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B. Size supports for multiple raceway or cable runs so capacity can be increased by a 25% minimum in the future.

C. Support individual horizontal single raceways with separate, malleable-iron pipe hangers or clamps.

D. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

E. Secure electrical items and their supports to building structure, using the following methods unless other fastening methods are indicated:
   1. Wood: Wood screws or screw-type nails.
   2. Gypsum Board: Toggle bolts. Seal around sleeves with joint compound, both sides of wall.
   3. Masonry: Toggle bolts on hollow block and expansion bolts on solid block. Seal around sleeves with mortar, both sides of wall.
   4. New Concrete: Concrete inserts with machine screws and bolts.
   5. Existing Concrete: Expansion bolts or threaded studs driven by powder charge and provided with lock washers.
   6. 6Structural Steel: Welded threaded studs or Spring-tension clamps.
      a. Comply with AWS D1.1 for field welding.
   7. Light Steel Framing: Sheet metal screws.
   8. Fasteners for Damp, Wet, or Weather-Exposed Locations: Stainless steel.
   9. Light Steel: Sheet-metal screws.
   10. Fasteners: Select so load applied to each fastener does not exceed 25% of its proof-test load.

3.7 IDENTIFICATION MATERIALS AND DEVICES

A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Install continuous underground plastic markers during trench backfilling, for exterior underground conduits. Locate 6 to 8 inches below finished grade. If width of multiple

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lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.

3.8 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair, refinish and touch up disturbed finish materials and other surfaces to match adjacent undisturbed surfaces.

END OF SECTION

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SECTION 16060 - GROUNDING AND BONDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. None.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Grounding Conductors, Cables, Connectors, and Rods:
   2. Chance/Hubbel
   3. Erico Inc. Electrical Products Group.
   4. Harger Lightning Protection, Inc.
   5. Ideal Industries, Inc.
   6. ILSCO
   7. Kearney/Cooper Power Systems.
   8. Lightning Master Corp.
   9. O-Z/Gedney Co.; a business of the EGS Electrical Group.
   10. Raco, Inc.; Division of Hubbell.
   11. Thomas & Betts, Electrical
   12. Or Approved Equal

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 16121 - Conductors and Cables.

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B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:
   1. Solid Conductors: ASTM B 3.
   2. Assembly of Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.

2.3 CONNECTOR PRODUCTS

A. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

B. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

C. Compression Connectors.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Sectional type; copper-clad steel.
   1. Size: 5/8” in diameter by 96” in length

PART 3 EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

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C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
   1. Feeders and branch circuits.
   2. Single-phase motor and appliance branch circuits.
   3. Three-phase motor and appliance branch circuits.
   4. Flexible raceway runs.

D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

E. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

F. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

G. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to metal water entrances to building. Connect grounding conductors to metal water pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

3.3 INSTALLATION

A. Install Ground Loop and grounding devices as indicated on the contract drawings and per requirements of this specification.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
   1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
   2. Make connections with clean, bare metal at points of contact.
   3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
   4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.

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5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

END OF SECTION

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SECTION 16075 - ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
   1. Color: Black letters on orange field.
   2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend over laminated with a clear, weather- and chemical-resistant coating.

C. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

D. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
   1. Not less than 6 inches wide by 4 mils thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.
   4. Printed legend indicating type of underground line.

E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

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2.2 NAMEPLATES AND SIGNS

A. Refer to drawings for details on Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16" thick for signs up to 20 sq. in. and 1/8" thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.

B. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

E. Circuit Identification Labels on Boxes: Install labels externally.
   1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
   2. Labeling Legend: Permanent listing of panel and circuit number or equivalent.

F. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker.

G. Color-Coding of Secondary Phase Conductors: Use the following colors for service, feeder and branch-circuit phase conductors:
   1. 208/120-V Conductors:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
   2. 480/277-V Conductors:
      a. Phase A: Yellow.
      b. Phase B: Brown.

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c. Phase C: Orange.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1" wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.

H. Apply identification to conductors as follows:

1. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

I. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8" high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

J. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with ½" high lettering on 1½" high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. Emergency system boxes and enclosures.
3. Disconnect switches.
4. Motor starters and VFDs.
5. Push-button stations.
6. Control devices.
7. Transformers.

END OF SECTION

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SECTION 16121 - CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers:
   1. Alcan Aluminum Corporation; Alcan Cable Div.
   2. American Insulated Wire Corp.; a Leviton Company.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.

D. Conductor Insulation Types: Type THHN-THWN and XHHW complying with NEMA WC 5.

2.2 CONNECTORS AND SPLICES

A. Manufacturers:
   1. AFC Cable Systems, Inc.

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2. AMP Incorporated/Tyco International.

3. Hubbell/Anderson.

4. O-Z/Gedney; EGS Electrical Group LLC.

5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance: Type XHHW, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type XHHW, single conductors in raceway.

D. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type XHHW, single conductors in raceway.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

D. Support cables according to Section 16050 - Basic Electrical Materials and Methods.

E. Identify and color-code conductors and cables according to Section 16075 - Electrical Identification.

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3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

END OF SECTION

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SECTION 16300 - DISCONNECT SWITCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Fusible switches.
   2. Non-fusible switches.

1.3 SUBMITTALS

A. Product Data: For each type of disconnect overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of disconnects with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Corporation; Cutler-Hammer Products.
   2. General Electric Co.; Electrical Distribution & Protection Div.
   3. Siemens Energy & Automation, Inc.
   4. Square D.
   5. Or Approved Equal

2.2 MANUFACTURED UNITS

A. Type HD, Heavy Duty, Single Throw, 240-V and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate

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indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   5. Lugs: Mechanical type, suitable for number, size, and conductor material.

C. Enclosures:
   1. Rated for environmental conditions at installed location. NEMA 4X typical unless otherwise noted.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Mount plumb and rigid without distortion of box.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 16075 - Electrical Identification.

B. Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Section 16060 - Grounding and Bonding.

B. Connect wiring according to Section 16121 - Conductors and Cables.

3.4 CLEANING

A. On completion of installation, inspect interior and exterior of disconnects. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16300

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SECTION 16420 - MOTOR CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Magnetic motor starters.
   2. Variable frequency drives.

1.3 SUBMITTALS

A. Product Data: For each type of motor control, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Submit dimensional drawings of VFD's and soft start starters showing accurately scaled equipment layouts. Drawings shall include, as a minimum: physical dimensions of each unit; general arrangements with incoming and outgoing conduit locations, schematic; connection diagram sufficient to install system, and enclosure details.

C. Wiring Diagrams: Submit schematic power and control wiring diagrams, prepared for this project, of complete VFD assemblies. General wiring diagrams with various non-applicable options shown are not acceptable. Clearly differentiate between factory and field wiring.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of motor controls and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.6 OPERATION AND MAITENANCE MANUALS.

A. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished. Where instruction booklets cover more than one specific

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model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features. A complete set of "as-built" wiring, fabrication, and interconnection drawings shall be included with the manuals.

PART 2 PRODUCTS

2.1 COORDINATION.

A. Verify all motor sizes and specifications from approved mechanical, process, and instrumentation shop drawings, contract drawings, and contract documents. It is the contractor's responsibility to fully coordinate the VFDs with the driven equipment. All equipment provided under this section shall comply with the requirements of the general project requirements.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Starters
   2. Cutler Hammer
   3. Allen-Bradley
   4. Square D
   5. Siemens
   6. General Electric
   7. Or Approved Equal

B. Variable Frequency Drives. All VFDs for this project shall be by the same manufacturer. The basis of design for this project is Cutler-Hammer's SVX9000 Series or Allen Bradley Power Flex 700. The following list of other manufacturers that meet the basis of design are acceptable:
   1. ABB
   2. Square D
   3. Toshiba
   4. Siemens
   5. Or Approved Equal

2.3 MOTOR STARTERS AND WIRING

A. Coordinate with the Electrical Contractor for motor control center starters.

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B. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 4X with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.

C. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.

D. Contacts shall open each ungrounded connection to the motor. Contacts shall be NEMA style, sized and rated, 75° C.

2.4 MAGNETIC STARTERS:

A. Unless otherwise indicated, provide NEMA style, sized and rated magnetic starters including contacts and coils for motors 3/4Hp and larger and for smaller motors where interlock or automatic operation is indicated or required:

B. Maintained contact H-O-A push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

C. Solid state adjustable motor overload. Select range so that upper limit is no more than 150% of the connected motor full load amps.

D. Interlocks, pneumatic switches and similar devices as required for coordination with control requirements.

E. In addition to the interlock & switches specified above each starter shall be provided with (4) four additional spare sets of auxiliary contacts, (2) two normally open & (2) two normally closed.

F. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.

G. Under-voltage release or protection. Re-start of equipment shall be automatic, except for the following:

H. All 3-phase motors shall be protected against loss of phase (single phasing protection).

2.5 VARIABLE FREQUENCY DRIVES (VFD):

A. Comply with NEMA (including NEMA ICS 7.1), and IEEE (including IEEE 519-1992)

B. Standards as applicable to wiring methods, construction and installation and operation of VFDs. Comply with applicable requirements of UL 908. "Power Conversion Equipment" and UL 508 C. Provide units which have been UL-listed and labeled by Underwriters Laboratory or ETL Testing. The entire unit shall carry this label, not just components.

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C. The manufacturer shall verify compatibility of each VFD unit with the motor being supplied under other Divisions. The vendor shall be responsible for reviewing other Division specifications sections, plans and schedules related to motors prior to bid and shall notify the Engineer at least ten (10) days prior to the bid of any discrepancies or incompatibilities between VFD units and motor characteristics.

D. Mount VFD and all components within the motor control center, local control panel or individually with a NEMA rating per the drawings.

E. Provide floor stand where building walls are not suitable for mounting drive.

F. Provide filtered, fan powered ventilation for drive cooling. Fan shall be sized for "dirty filter" condition, at project altitude.

2.6 INPUT POWER:

A. The drive shall be capable of accepting facility power as specified on the drawings.
   1. Variations of up to plus or minus 10% of line voltage and plus or minus 2HZ of line frequency shall be permitted without the drive shutting down on a fault.
   2. Power line interruptions of up to 0.5 seconds shall be permitted without the drive shutting down on a fault.
   3. The drive input circuitry shall not generate line notches or large voltage transients on the incoming line.
   4. The drive efficiency at rated load and frequency shall be 95% or better. The drive shall present a displacement power factor of 0.95 or better to the AC line at any speed or load.
   5. Manufacturer shall guarantee that harmonic voltage and current distortion, on the line side (input terminals) of the VFD does not exceed 5% total voltage Harmonic distortion, and 15% total current Harmonic distortion.
   6. Manufacturer shall correct harmonic voltage and current distortion with an AC line reactor, an isolation transformer, or a tuned filter to stay within the above limit.
   7. Manufacturer shall review electrical drawings to determine optimum characteristics of the reactor/filter system.
   8. The installed drive shall be tested to verify the above distortion limits. The manufacturer shall replace the reactor/filter system if the installed drive does not meet the THD criteria.

2.7 OUTPUT POWER:

A. The variable frequency AC drive shall convert 3 phase, 60 HZ input power to an adjustable AC frequency and voltage for controlling the speed of any standard NEMA B Design, AC squirrel cage motors driving variable torque loads. The drive shall be rated for continuous duty at the NEC standard full load current of its associated motor.

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1. Transistors (IGBT) to produce a sine weighted PWM three phase output for the load.
2. The drive shall have sufficient capacity to provide stepless speed control of the motor throughout the operating range as specified herein.
3. The drive output will be adjustable from 0 to 60 HZ.
4. The drive shall have the capability to adjust the frequency above 4 kHz. The drive shall not operate with a frequency above 12 kHz.
5. The IGBTs shall have a minimum rating of 1200 VDC on 480 V units and 600 VDC on 230 V units.
6. The drive shall be suitable for operating at the altitude of the project location with no degradation or loss of performance.

B. Control and Operation Features:
1. Adjustable acceleration and deceleration, with automatic acceleration rate limiting to avoid overload and automatic deceleration rate limiting to avoid excessive regeneration voltage.
2. Speed/frequency settings to limit the maximum and minimum motor speed, to avoid up to 3 system critical resonance points and to provide a preset speed for operation in the event of loss of the remote speed signal.
3. Capability to set drive to a pre-determined speed upon a contact closure input from the BAS.
4. Capability of restarting into a rotating motor.
5. The following operator control and monitoring functions shall be accessible without opening the door of the enclosure.
    a. HAND/OFF/AUTO (or Local/Off/Remote) selector switch.
        1) With the “H-O-A” switch in the “HAND” or “LOCAL” position, the motor shall start in VFD mode.
        2) With the “H-O-A” switch in “AUTOMATIC” or “REMOTE”, the motor shall start from the remote start/stop input in VFD input speed signal.
        3) With the “H-O-A” switch in the “OFF” position, the run circuit will be open and the VSC will not operate.
        4) This must be a physical switch, not a keypad input function
        5) Manual (local) speed adjustment.
        6) Frequency (speed) indication.
        7) Output amperage indication.
        8) Pilot lights for:
            a) Power On (green)
            b) VFD Fault (red)
            c) Motor on VFD (green)
            d) Motor Overload (red)

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6. The following control interfaces shall be provided:

    a. Remote start/stop (run enable input)
    b. Remote speed input signal
    c. 4-20 mA, 0-5 VDC, 0-10 VDC, or as required by control system.
    d. Safeties interlock input
    e. Provide a control relay and terminal block in the by-pass compartment to allow hardwired safety shutdown in either the VFD.
    f. Fault indication output contacts. Indicate fault for the following:
        1) Drive protection features
        2) Safety interlock
        3) Drive hardware fault
        4) Input power fault
        5) Others as provided by manufacturer
    g. Speed indication output (isolated)
    h. Amperage indication output.
    i. Run forward input.
    j. Run backward input.
    k. Drive running (status) output.
    l. Drive on manual output.
    m. Pre-set speed input.
    n. Ethernet communications

7. Provide a key pad and scrolling LCD display for operator interface with programming capabilities, fault diagnostics, fault reset, and security lockout code. Information shall be presented in plain English, not requiring codes.

    a. Key pad shall not be accessible without opening enclosure panel door.
    b. In addition to the interlock and switches specified above, each variable frequency drive shall be provided with (4) four additional spare sets of auxiliary contacts, (2) two normally open and (2) two normally closed.

C. Drive protection and safety features:

1. Ground fault protection.

2. Electronic motor overload protection.

3. Over-voltage/under-voltage protection.

    a. The VFD shall be arranged to provide automatic restart after a trip condition resulting from over-voltage or under-voltage.
    b. For safety, the drive shall shut down and require manual reset and restart if the automatic reset/restart function is not successful within a maximum of five attempts.

D. Inverse characteristic time-overcurrent overload protection for the motor sized in accordance with NEC requirements.

E. Drive shall be capable of withstanding random application of an output short circuit without damage to drive components or fuses.

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F. Input phase loss and under-voltage protection.

G. Torque/current limit control which will slow the motor without tripping when the motor is subjected to an overload, or slow the acceleration ramp when accelerating a high inertia

H. High/over temperature protection.

I. VFD shall include a “Bus Charged” warning indicator, and shall be provided with automatic circuitry to discharge the bus within 120 seconds after main power is disconnected.

J. For drive manufacturers who use portable test meter for diagnostics, provide not less than one test meter for every five (5) variable frequency drives for each model or type used. Meters shall be supplied to the Owner upon completion of the project.

K. Each drive shall include an RS 232 port with 25 pin "D" connector to allow downloading of parameter settings and fault history logs to a standard IBM compatible portable computer or printer. Software to allow download of setting shall be included.

L. The audible dBa sound level of the complete system (motor & VFD) when operated over the full speed range shall be not more than 10% above the sound level of the motor operated in the by-pass mode (60 hZ building power). This test will be performed during initial startup. Corrections needed to achieve this requirement shall be made by the VFD supplier at no cost to the Owner.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install motor controls and accessories according to NEMA.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 16075 - Electrical Identification.

B. Nameplates: Label each control with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Section 16060 - Grounding and Bonding.

B. Connect wiring according to Section 16121 - Conductors and Cables.

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3.4 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.5 CUSTOMER TRAINING.

A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training session shall consist of one 2-hour session, and the schedule shall be arranged and coordinated with the Owner.

END OF SECTION

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SECTION 16442 – ELECTRICAL PANELBOARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Lighting and appliance branch-circuit panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Panelboard Schedules: For installation in panelboards.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
      a. Eaton Corporation; Cutler-Hammer Products.
      b. General Electric Co.; Electrical Distribution & Protection Div.
      c. Siemens Energy & Automation, Inc.
      d. Square D.
      e. Or Approved Equal.

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2.2 MANUFACTURED UNITS

A. Enclosures: Surface-mounted cabinets. NEMA PB 1, Type 1.
   1. Rated for environmental conditions at installed location.
      a. Other Wet or Damp Indoor Locations: NEMA 250, Type 3R or 4.
   2. Front: Secured to box with hinged cover per drawing detail.
   3. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
   4. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase and Ground Buses:
   1. Material: Hard-drawn copper, 98% conductivity.
   2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material.
   1. Main and Neutral Lugs: Mechanical type.
   2. Ground Lugs and Bus Configured Terminators: Compression type.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. UL label indicating series-connected rating with integral or remote upstream overcurrent protective devices. Include size and type of upstream device allowable, branch devices allowable, and UL series-connected short-circuit rating.

B. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: UL 489, with series-connected rating to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.
   1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
   2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
   3. Multi-pole units enclosed in a single housing or factory-assembled to operate as a single unit.

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PART 3 EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

C. Install filler plates in unused spaces.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 16075 - Electrical Identification.

B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.3 CONNECTIONS

A. Ground equipment according to Section 16060 - Grounding and Bonding.

B. Connect wiring according to Section 16121 - Conductors and Cables.

3.4 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

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SECTION 16472 - SURGE SUPPRESSIVE DEVICES

PART 1 GENERAL

1.1 DESCRIPTION

A. This section describes the materials and installation requirements for surge protective devices (SPD) for the protection of all AC electrical circuits.

1.2 SUBMITTALS

A. Product Data: Include dimensions and manufacturer's technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: Submit dimensional drawings of SPDs showing accurately scaled equipment layouts. Drawings shall include, as a minimum: physical dimensions of each unit; connection diagram sufficient to install system, and enclosure details.

C. Wiring Diagrams.

PART 2 PRODUCTS

2.1 SURGE SUPPRESSOR

A. SPD shall be listed in accordance with UL 1449 Second Edition to include Section 37.3 highest fault current category. SPD shall be UL 1283 listed.

B. SPD shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G in WYE systems, and L-L, L-G in DELTA systems.

C. SPD shall be modular in design. SPD for service entrance application shall provide two modules per phase for redundant protection.

D. Each mode including N-G shall be fused with a UL Recognized 200kAIC surge rated fuse and incorporate a thermal cutout device.

E. SPD shall meet or exceed the following criteria:
   1. Minimum surge current capability (single pulse rated) per phase shall be: Service entrance applications: 360kA per phase

2.2 MANUFACTURERS

A. Approved Vendors:
   1. Advanced Protection Technologies or rebranded products of APT.
   2. Square D.
   3. Eaton/Cutler Hammer.
   4. Siemens Energy & Automation.

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5. General Electric

6. Or Approved Equal

PART 3 EXECUTION

3.1 SERVICE ENTRANCE:

A. One primary suppressor shall be installed external to the service entrance in accordance with manufacturer instructions.

B. The SPD shall be installed on the load side.

C. The SPD ground shall be bonded to the service entrance ground.

END OF SECTION

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SECTION 16670 – LIGHTING FIXTURES

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide lighting fixtures in accordance with the Contract Documents.

1.2 SUMMARY:

A. Extent, location, and details of lighting work are indicated on drawings and in schedules.

B. Types of lighting in this section include the following:
   1. Fluorescent.
   2. LED

C. SUBMITTALS:
   1. Product Data: Submit manufacturer's product data and installation instructions on each type of luminaire and component. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the approved manufacturer:

1.3 EXTRA MATERIALS:

A. Lamps: Furnish stock or replacement lamps amounting to 15%, but not less than 4 lamps in each case, of each type and size lamp used in each type luminaire.

B. Ballasts: Furnish stock or replacement ballasts amounting to 5%, but not less than 2 of each type used in each type luminaire.

PART 2 PRODUCTS

2.1 LIGHTING FIXTURES, BALLASTS AND LAMPS

A. This section of the specifications includes the furnishing and installation of lighting fixtures and lighting equipment for all outlets in the project as listed in the fixture schedule, including the connection of the fixtures and equipment to the electric wiring of the building.

B. Lighting fixtures shall be of the types, sizes, etc., shown in the fixture schedule and notes referenced herein.

C. Lighting fixtures described herein are intended to indicate the general fixture type, which shall be substantially as specified. It is not the intent of this specification to require the product of any particular manufacturer whose product is specified.

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D. The furnishing and installation of the lighting fixtures or lighting equipment must be executed in a manner that will insure completion coincident with the completion of the construction of the project, unless otherwise required by the contract specifications.

E. Materials and workmanship shall be of the highest quality and in accordance with the highest commercial standards.

F. Fixtures shall be complete with all necessary appurtenances, wiring, lamp holders, lamps, reflectors, glassware, canopies, wall bases, pendants, etc., and shall be wired with Type AF fixture wire not less than No. 14 AWG. All pendants and canopies shall be of the type required for the specific lighting fixtures and shall be of the same manufacturer as the lighting fixture. Fixtures shall carry UL labels.

G. Fixture finishes damaged prior, during or after installation shall be touched up with factory colored paint. Broken fixture components shall be replaced.

H. All lighting fixtures shall be lamped as indicated on the lighting fixture schedule. Substitutions must be submitted to the Engineer for approval.

I. At the time of acceptance of the building, the lighting fixtures shall be completely re-lamped as necessary and shall be thoroughly cleaned.

J. All linear fluorescent lamps shall be 1" (T8) in diameter with 4100°K surface temperatures and with a color rendering index (CRI) of 75.

K. All lamps shall be in working order at the time of final acceptance of the work by the Owner and the Architect. This contractor shall replace all defective lamps with new lamps until the work is finally accepted.

L. Provide all lamps, plus 5% spares for each type required

M. Lighting fixtures shall be as cataloged on the fixture schedule.

N. Type A fixture:
   1. Manufacturer: Hubbell
   2. Model: VBGG

PART 3 EXECUTION

3.1 LIGHTING FIXTURES AND WIRING

A. Install lighting fixtures to types indicated, where shown and at indicated heights, in accordance with lighting fixture manufacturer's written instructions and with recognized industry practices, to ensure that fixtures comply with requirements and serve intended purposes. Comply with NEMA standards and requirements of National Electrical Code pertaining to installation of interior lighting fixtures and with applicable portions of NECA's Standard of Installation.

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B. Fasten fixtures securely to structural support member of building and check to ensure that solid pendent fixtures are plumb.

C. Clean interior lighting fixtures of dirt and debris upon completion of installation.

D. Protect installed fixtures from damage during remainder of construction period.

E. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

F. At date of substantial completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Engineer.

END OF SECTION

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SECTION 16903 - PROGRAMMABLE LOGIC CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Programmable logic controllers

B. Input/output (I/O) assemblies

C. Power supplies

D. Communication modules

E. Networking switches

F. Spare Parts

G. System installation, network configuration, communication and I/O testing, and demonstration

H. Replacement and upgrade of existing PLCs and I/O systems in existing facilities

I. Creation of alarm logic and alarm dialer configuration

1.2 RELATED SECTIONS

A. Section 13400-Measurement and Control Instrumentation

B. Section 16050-Basic Electrical Materials and Methods

1.3 REFERENCES

A. ANSI/ISA S5.1-Instrumentation Symbols and Identification

B. ANSI/ISA S51.1-Process Instrumentation Terminology

C. ANSI X3.4-American National Standard Code for Information Interchange

D. EIA TIA-232-F-Interface Between Data Terminal Equipment and Data Circuit Terminating Equipment Employing Serial Binary Data Interchange

E. EIA 422-B-Electrical Characteristics of Balanced Voltage Digital Interface Circuits

F. EIA 423-B-Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits

G. AB Pub. DN-2.I 5-DeviceNet -System Overview

H. AB Pub. DN-6.7.2-DeviceNet Cable System -Planning and Installation Manual

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I. AB Pub. 1786-2.12-ControINet Network -System Overview Release 1.5

J. AB Pub. 1786-62.I-ControINet Coax Cable System -Planning and Installation Manual

K. IEEE 802.3-Infonnation Technology, Local and Metropolitan Area Networks

L. ISO/IEC 8802-3-Information Technology, Local and Metropolitan Area Networks

M. IEC 61 131-I-Programmable Controllers, General Information

N. IEC 61 131-2-Programmable Controllers, Equipment Requirements

O. IEC-61131-3-Programmable Controllers, Programming Languages

P. IEC 61158-Digital Data Communication For Measurement And Control

1.4 DESIGN REQUIREMENTS

A. Control system architecture shall be based on the Allen-Bradley Micro Logix hardware platform

B. Analog signals to equipment by others or under other sections: 4-20 mA dc, negative ground for a looped impedance of 0-250 ohms

C. Analog signals from equipment by others or under other section: 4-20 mA dc, negative ground, suitable for 100-500 ohms loop impedances

D. Analog signal isolators shall be powered independently of the input signal. Signal isolator output shall be capable of driving two 4-20 mA dc Analog input ports

1.5 PERFORMANCE REQUIREMENTS

A. Provide all required buffers, isolators, signal converters, and amplifiers for coordination with equipment furnished under other section, and between items of equipment furnished hereunder, whether indicated on the Drawings or detailed specifications, or not.

B. Provide all input/output devices required for a complete and functioning system

C. Provide 1 terra bite mass storage device and historian software for recording and archiving of data

1.6 SUBMIITALS

A. Submit under provisions of Section 01330.

B. Shop Drawings:
   1. Indicate layout of completed assemblies

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2. Interconnecting cabling including shielding and grounding

3. Dimensions, weights, and external power requirements

4. Provide loop diagrams and I/O list

5. Network system block diagram showing all network components

C. Product Data:

1. Provide bill of material listing all components, cables, connectors, and modules included in the system complete with catalog numbers and quantities

2. Provide sufficient information to verify compliance with this specification for all hardware and software

D. Manufacturer's Certificate: Provide under provisions of Section 01330 that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Provide for each component.

F. Submit I/O assignment listing and complete network and hardware configuration listing

1.7 PROJECT RECORD DOCUMENTS

A. Provide under provisions of Section 01780

B. Accurately record actual locations of controller cabinets and input and output devices connected to system. Include interconnection wiring and cabling information, and terminal block layouts and terminal numbering in controller cabinets

C. Provide shop drawings in hard copy and AutoCAD 2004

1.8 OPERATION AND MAINTENANCE DATA

A. Provide under provisions of Section 01780.

B. Include bound copies of operating and programming instructions.

C. Include card replacement, adjustments, and preventative maintenance procedures and materials.

D. Hard copy and magnetic program listings of each PLC program after field installation completed

1.9 QUALIFICATIONS

A. All products specified in Section 13400, and Section 16903 to be supplied by an I&C integrator

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B. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 2 years documented experience

1.10 CONTROLS CONFERENCE

A. Convene two weeks prior to start of PLC panel manufacturing

B. Discuss requirements of this Section 13400, Section 16903 and other related sections.

C. Present written request for clarifications to Engineer

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle products to site under provisions of Section 01600

B. Accept products on site in factory containers and verify damage

C. Store products in clean, dry area; maintain temperature to NEMA ICS I

1.12 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature above 32 degrees F and below 104 degrees F during and after installation of products.

B. Maintain area free of dirt and dust during and after installation of products.

1.13 MAINTENANCE SERVICE

A. Provide maintenance services of programmable logic controllers for one year from Date of Substantial Completion.

B. Visit site four months after final acceptance to check and adjust any malfunctions and advise plant personnel in operating and adjustment procedures

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. PLC System
   1. PLC Hardware:
      a. Allen-Bradley MicroLogix
   2. All components of the PLC system shall be standard products manufactured by Allen-Bradley, third party components shall not be permitted

2.2 MATERIALS

A. PROGRAMMABLE LOGIC CONTROLLER
   1. The control system consists of 1 Allen-Bradley MicroLogix 1100 (1763-

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L16AWA PLC in the Tank Vault, with associated I/O assemblies, and one PLC in the Kachina Pump Station. The I/O counts for the PLCs are as follows:

a. Kachina Tank PLC
   1) Digital Inputs: 10
   2) Digital Outputs: 6
   3) Analog Inputs: 4
   4) Analog Outputs: 2
b. Kachina BPS PLC
   1) Digital Inputs: 10
   2) Digital Outputs: 6
   3) Analog Inputs: 4
   4) Analog Outputs: 2
c. Provide with a 1762-IF2OF2 combo card

2. Minimum CPU:

   a. Allen-Bradley MicroLogix 1100
   b. Specific controller model selection dependent on number of I/O points, memory requirements, program size, communication requirements, etc.
   c. Memory Size: Twice the size required for I/O and indicated logic
   d. Storage Registers: Twice the size required
   e. RS-232 Interface: Integral
   f. Ethernet Port

3. Service conditions:

   a. Temperature: 40-104 degrees F
   b. Humidity: 80 percent
   c. Altitude: 5502 feet above mean sea level

4. Configuration:

   a. Processor unit: Include chassis, processor, power supply, random access memory, battery backup, input/output modules, and communication interfaces

5. Spare Capacity:

   a. I/O points: See each I/O type below for spare requirements
   b. I/O rack: Provide a minimum of 25 percent spare pre-wired to field terminal blocks
   c. Group I/O modules by type and leave a minimum of one space after each type grouping to permit the addition of a future module of the group type
   d. Power supply: Provide power supplies with a minimum excess capacity of 25 percent above that consumed by the fully loaded system

6. Programming functions:

   a. Programmed using RS Logix 500

7. Programming Instruction Set:

   a. Language Characteristics: Ladder diagram
   b. Logic Operations: AND, OR, XOR, NOT

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c. Register Operations: Store, recall
d. Math Operations: Addition, subtraction, multiplication, division, square root, matrix operations
e. Process Control: Proportional-Integral-Derivative

B. INPUT/OUTPUT UNITS
1. General:
a. Plug in units, individually removable from the I/O assembly during system operation without disconnecting field wiring, disturbing assembly wiring, halting CPU operation, halting program execution, powering down the I/O rack, or causing a fatal logic error
b. I/O units must be compatible with the PLC processor on which they will be installed. See section 2.2.A in this specification for each PLC processor model.
c. Use pre-wired cables and termination modules
2. Digital inputs:
a. 120VAC
b. Quantity: 10 per card
c. Individually isolated inputs
d. 25 percent active spare points at each I/O rack, ten minimum
3. Digital outputs:
a. Relay type
1) 10-256 V AC
2) 5-150VDC
b. Quantity: 6 per card
c. Individually isolated outputs
d. 25 percent active spare points at each I/O rack, six minimum.
4. Analog inputs:
a. 0-20.5 mA DC / 10.25 V DC
b. Quantity: 8 differential per card
c. Capable of individual selection of voltage or current input
d. 25 percent active spare at each I/O rack, 2 minimum
5. Analog outputs:
a. 0-21 mA DC, fully isolated
b. Quantity: 4 per card
c. Output signal, 4-20 mA, no external power required, each signal fully isolated
d. 25 percent active spare at each I/O rack, 2 minimum

C. I/O RACK POWER SUPPLY
1. Input voltage: 120 volts, 60 Hz
2. Sized for ultimate I/O expansion
3. Diagnostic status indication

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4. Accessories

a. HMI Panels

1) PanelView Operator stations

a) 6” Color graphic

b) Touchscreen

c) Ethernet communications

d) Panelview Plus P/N 2711PC-K4M20D8

b. DATA COMMUNICATION SYSTEM

1) General:

a) EtherNet/IP

2) Hardware:

a) Communication interface modules

(1) Provided with PLC processor

3) Data communication:

a) The communications system shall be functionally equivalent to that shown on contract drawings

b) Utilize Cat5e cable for local segments

c) Utilize fiber optic segments between buildings

d) Provide all required signal devices and converters for a complete and working system

c. UNINTERRUPTIBLE POWER SUPPLY (UPS)

1) Each PLC control panel to be provided with UPS to supply power to PLC and all VO loops in accordance with Section 13400

5. SOURCE QUALITY CONTROL AND TESTS

a. Provide testing under provisions of Section 01400

PART 3 EXECUTION

3.1 CONFIGURATION

A. The I&C Integrator will provide all programmable logic controller hardware configuration, communications setup, and configure all I/O data and program files, and will complete all PLC ladder logic programming per the contract documents. Contractor to furnish softcopy of ladder logic programming to Owner for coordination with SCADA updates.

B. Contractor to furnish sample ladder logic files in advance of field work

C. All SCADA computer configuration by Owner’s representative

3.2 EXAMINATION

A. Verify that surfaces are ready to receive work.

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B. Verify field measurements are as shown on Drawings.

C. Verify that required utilities are available, in proper location, and ready for use.

D. Beginning of installation means installer accepts conditions.

3.3 INSTALLATION

A. Sequence work in accordance with Section 01110. Perform coordination with other trades to support switchover and replacement of existing PLCs.

B. Provide complete integration with SCADA components for Automatic operation of all Headworks controls with existing system or new SCADA software.

C. Perform installation and checkout of Operations Building PLC controls once work has been completed and all new controls are fully operational.

D. Install in accordance with manufacturer's instructions.

E. Connect input and output devices as shown on Drawings.

F. Perform I/O loop checkout in accordance with Section 13400

3.4 MANUFACTURER'S FIELD SERVICES

A. Provide under provisions of Division 1.

B. Provide in accordance with Section 13400

C. During installation:
   1. Advise Contractor on installation
   2. Check, calibrate, and place equipment into operation
   3. Visit the jobsite as often as required and spend as much time as is necessary to insure compliance with the specifications

D. Demonstration:
   1. Demonstrate operation of each I/O loop from field instrument terminals through the completed system to Owner and Engineer. Make any changes required for proper system operation. Record results on the loop calibration record sheets.

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PART 4 SCHEDULE

4.1 SEE TABLE BELOW

NEW PLC I/O LIST

TAG NUMBER		DESCRIPTION	P&ID Sheet	RTU LOCATION	I/O TYPE	Alarm	SCADA Trend
YA	021	PUMP 1 RUNNING	IO-02	PUMP STATION	DI	NO	NO
HC	021	PUMP 1 HAND CONTROL	IO-02	PUMP STATION	DO	NO	NO
YL	021	PUMP 1 RUNNING LIGHT	IO-02	PUMP STATION	DI	NO	NO
YA	022	PUMP 2 RUNNING	IO-02	PUMP STATION	DI	NO	NO
HC	022	PUMP 2 HAND CONTROL	IO-02	PUMP STATION	DO	NO	NO
YL	022	PUMP 2 RUNNING LIGHT	IO-02	PUMP STATION	DI	NO	NO
PI	025	PRESSURE INDICATOR	IO-02	PUMP STATION	DI	NO	NO
FI	020	FLOW INDICATOR	IO-02	PUMP STATION	AI	NO	NO
FQI	020	FLOW TOTALIZER	IO-02	PUMP STATION	AI	NO	YES
FI	010	FORWARD FLOW INDICATOR	IO-03	VALVE VAULT	AI	NO	NO
FQI	010	FORWARD FLOW TOTALIZER	IO-03	VALVE VAULT	AI	NO	YES
FI	011	REVERSE FLOW INDICATOR	IO-03	VALVE VAULT	AI	NO	NO
FQI	011	REVERSE FLOW TOTALIZER	IO-03	VALVE VAULT	AI	NO	YES
ZC	006	BUTTERFLY VALVE OPEN	IO-03	VALVE VAULT	DO	NO	NO
ZIO	006	BUTTERFLY OPEN	IO-03	VALVE VAULT	DI	NO	NO
ZIC	006	BUTTERFLY CLOSED	IO-03	VALVE VAULT	DI	NO	NO
LAH	013	WATER ON FLOOR ALARM	IO-03	VALVE VAULT	DI	YES	NO
UA	014	INTRUSION ALARM	IO-03	VALVE VAULT	DI	YES	NO
LI	001	LEVEL INDICATOR	IO-03	VALVE VAULT	AI	YES	YES

END OF SECTION

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