

CONTRACT DOCUMENTS AND TECHNICAL SPECIFICATIONS

FLAT ROCK PUMP STATION REPLACEMENT



Prepared for:

Oconee Joint Regional Sewer Authority

KCI Project No:

962205803

May 2023

Issued for Bids



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CHALLENGE**

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TECHNICAL SPECIFICATIONS

Prepared for the
OCONEE JOINT REGIONAL SEWER AUTHORITY



KCI Project No. 962205803



MAY 2023



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SECTION 00111

Advertisement for Bids

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OCONEE JOINT REGIONAL SEWER AUTHORITY REQUEST FOR BIDS

Flat Rock Pump Station Replacement

OJRSA PROJECT #2023-XXXXX

KCI PROJECT #962205803

SCIIP PROJECT # A-23-C153



RFB SUBMITTAL DUE DATE/ TIME: May 23, 2023 at 2:00 PM LOCAL TIME

Advertisement Date	April 18, 2023 by 4:00 pm Local Time
Pre-Bid Conference - Attendance Encouraged	May 9, 2023 at 2:00 pm Local Time
Deadline for Inquiries	May 16, 2023 at 4:00 pm Local Time
Submittal Deadline	May 23, 2023 at 2:00 pm Local Time
Bid Opening	May 23, 2023 at 2:00 pm Local Time
Project Award	June 5, 2023 OJRSA Board Meeting
Review of Contract Documents and Notice to Proceed Issued	By June 23, 2023 (tentative)
Begin Project	Upon notification of Notice to Proceed by OJRSA
Project Completion	Negotiable but must be closed out by 12/31/26 to comply with SCIIP grant requirements

REQUEST FOR BIDS

Purpose

The Oconee Joint Regional Sewer Authority (“OJRSA” or “Owner”) is requesting bids from contractors, hereafter referred to as “Offerors,” “Contractors,” or “Firms” interested in the replacement of the existing Flat Rock Pump Station located near Walhalla, South Carolina.

OJRSA will select one (1) Contractor to complete the project. The contract method will be a standard services contract as provided by the OJRSA and/or its consulting engineer.

Scope

The Project generally consists of the following Work:

- Demolition of existing wetwell and portions of the existing pump structure.
- Demolition of existing radio antenna, fuel storage tanks, and other site features.
- Demolition and removal of existing electrical components and controls.
- Providing and installing new pumps, control panel, standby power generator, and other items as shown on the plans.
- Providing and installing new electrical wiring, panels, conduit, etc.
- Providing and installing new piping, valves, and precast concrete structures as shown on the plans.
- Installation of new gravity sewer and forcemain connections as shown on the plans.
- Bypass pumping during project construction.
- Site work as shown on project plans including, but not limited to, grading, paving, and retaining wall installation.

Bids will be received for a single prime contract and shall be on a unit price basis.

Pre-Bid Conference

A Pre-Bid Conference and site visit will be held on May 9, 2023 at 2:00 pm Local Time at the Oconee Joint Regional Sewer Authority’s Coneross Creek Water Reclamation Facility located at 623 Return Church Road, Seneca, South Carolina. Representatives of the Owner and engineer will be present to discuss the Project. Attendance at the conference is encouraged but not required.

Contractor Qualifications

No bid will be considered unless the bidder is legally qualified under the provisions of the South Carolina Contractor's Licensing Law (South Carolina Code of Laws as amended on April 1, 1999, Chapter 11, Sections 40-11-10 through 40-11-428). Contractors shall have a classification of WP or WL.

Obtaining Bid Documents

Bidding Documents can be downloaded under QuestCDN Project #XXXXX at www.questcdn.com OR www.kci.com (Project Bid Information link on bottom of KCI home page) for a non-refundable charge of \$20.00. Contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in viewing or downloading this digital project information. Any other project related questions or requests for information (RFI) shall be directed to Kara Hrkach (kara.hrkach@kci.com).

Bidding Documents also may be examined online at www.questcdn.com or the office of the Engineer, KCI Technologies, Inc., 106 Clair Drive, Piedmont, SC 29673, 864-269-0890, on Mondays through Fridays between the hours of 8:00 am until 5:00 pm.

Only those contract drawings, specifications, and bid documents obtained from the Engineer (or from QuestCDN) are official. Bidders cannot rely on the accuracy of copies of the aforementioned documents, drawings, specifications, etc. obtained from any other source. Bidder's must be on the Engineer's official plan holders list for the bids to be accepted by the Owner.

Deadline for Inquires

Any questions regarding this Request for Bids (RFB) should be submitted by way of email to kara.hrkach@kci.com no later than May 16, 2023 at 4:00 pm Local Time. Answers will be submitted as an addendum to this RFB and made available to all Offerors on the OJRSA website (www.ojrsa.org/resources) and on QuestCDN.

By submitting a bid, the Offeror represents that submitter has read and understood the Solicitation and that the Offer is made in compliance with the Solicitation. Offerors are expected to examine the Solicitation thoroughly and should request an explanation of any ambiguities, discrepancies, errors, omissions, or conflicting statements in the Solicitation. Failure to do so will be at the Offeror's risk.

Bid Submittal

Offerors must submit their competitive sealed bid using the attached bid form. **BIDS SUBMITTED BY EMAIL WILL NOT BE ACCEPTED.** All submittals must be complete. It is the Offeror's responsibility to check for calculation errors and completeness prior to submittal.

Bidders must deposit security with all bids. Security shall be in the form of a certified check or bid bond made payable to the Owner and shall be for an amount equal to not less than five percent (5%) of the amount of the bid. Provisions of the security shall be as described in the Information for Bidders.

SEALED BIDS MUST BE RECEIVED BY 2:00 PM LOCAL TIME ON MAY 23, 2023. LATE SUBMITTALS WILL NOT BE ACCEPTED.

Bids will be publicly opened and read soon after the bid deadline.

SCIIP Funding Requirements

Funding for the project shall be provided via a SCIIP grant from the SC RIA and local match funding provided by the Easley Combined Utilities. As a result, contractors and subcontractors shall comply with the applicable contract provisions required by the Uniform Administrative Requirements, Cost Principals and Audit Requirements (also referred to as Uniform Guidance) found in 2 CFR 200 Appendix II.

Federal requirements will apply to the contract. All contractors and subcontractors are required to be registered in the federal System for Award Management (SAM) prior to the contract award. Bidders on this work will be required to comply with the President's Executive Order No. 11246 & Order No. 11375 which prohibits discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, the Contract Work Hours (40 U.S.C. 3702 of the Act), Safety Standards Act, and 40 CFR 33.240, the Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. 3601et seq.), Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, Title II of the Americans with Disabilities Act of 1990, Drug-Free Workplace set forth in 31 CFR Part 20, the Clean Air Act, and the Federal Water Pollution Control Act.

Bidders must also make positive efforts to use small and minority-owned business and to offer employment, training and contracting opportunities.

Selection Process

The OJRSA shall open all sealed bids no sooner than 2:00 pm Local Time on May 23, 2023. Following approval by SC RIA and the OJRSA Board of Commissioners, the contract shall be awarded to the lowest total bid submitted by the Offeror that meets the minimum criteria contained within this RFB.

The OJRSA may make such investigation as it deems necessary to determine the ability of a Contractor to provide full performance as outlined in the RFB. The Contractor will furnish to the OJRSA all such information and data for this purpose upon request. The OJRSA reserves the right to reject any Contractor if the evidence submitted by or investigation of such Applicant fails to satisfy the OJRSA that such Applicant is properly qualified to carry out the obligations as stated herein.

South Carolina Domicile Requirement

The OJRSA shall not require a domicile obligation for this project.

Safety and Traffic Control

THE SAFETY OF ALL CONTRACTORS OF OJRSA IS OF UTMOST IMPORTANCE! Contractors shall comply with applicable requirements established by OSHA, SCDOT, Oconee County, and other entities when working on OJRSA property, along roadways, on private property, etc.

Insurance

Contractor agrees to maintain and keep in force during the life of this project, with a company or companies authorized to do business in South Carolina, Errors and Omissions Liability Insurance in the amount of \$1,000,000. Certificates for such policies shall be provided by the firm's insurance agent or broker to OJRSA within fifteen (15) working days from the date of award with the OJRSA listed as additional insured. Contractor will provide OJRSA a minimum of thirty (30) days advance notice in the event of the insurance policies or insurance policy is canceled.

Proprietary/Confidential Information

The Offerors are asked for any restrictions on the use of data contained in their responses and told that proprietary information will be handled in accordance with applicable law, regulations, and policy of the government and the OJRSA. All proprietary/confidential information must be clearly marked as "Proprietary/Confidential." If information is deemed to not contain such information by OJRSA legal counsel as it relates to privacy laws, then it may be made available to the public upon request.

Background Check

OJRSA reserves the right to conduct a background inquiry of each Offeror which may include the collection of appropriate criminal history information, contractual business associates and practices, employment histories, and reputation in the business community. By submitting qualifications to the OJRSA, the Offeror consents to such an inquiry and agrees to make available to the OJRSA such books and records as the OJRSA deems necessary to conduct the inquiry.

Rights Reserved by OJRSA

The OJRSA reserves the right to reject any or all submittals; to waive any informality or irregularity not affected by law; and to evaluate, in its absolute discretion, the qualification statements submitted. Qualifications should be complete as initially submitted.

Bids may be held by the Owner for a period not to exceed sixty (60) days from the date of the opening of bids.

Other Information

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

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SECTION 00200

Instructions to Bidders

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INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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ARTICLE 1—DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:
- A. *Issuing Office*—The office from which the Bidding Documents are to be issued, and which registers plan holders.

ARTICLE 2—GENERAL INFORMATION

- 2.01 The Owner is aware of the long delays in obtaining the materials for the project due to the current construction environment. As a result, the Owner will set the “Notice to Proceed” date (starting the contract completion period for the project) after verifying/confirming with the Contractor (and their suppliers) what the material delivery dates will be for the project.
- 2.02 Funding for the project shall be provided via a SCIIP grant from the SC RIA and local match funding provided by the Oconee Joint Regional Sewer Authority. As a result, contractors and subcontractors shall comply with the applicable contract provisions required by the Uniform Administrative Requirements, Cost Principles and Audit Requirements (also referred to as Uniform Guidance) found in 2 CFR 200 Appendix II. In the event of a conflict between these Federal Provisions, the body of the contract, or any attachments or exhibits incorporated into and made a part of the contract, the Federal Provisions shall control.
- A. Termination for Cause and Convenience: The contract may be terminated in whole or in part as follows:
1. By the Grantee, if a contractor fails to comply with the terms and conditions of the SCIIP award;
 2. By the Grantee, to the greatest extent authorized by law, if an award no longer effectuates the program goals or agency priorities;
 3. By the Grantee with the consent of the contractor, in which case the two parties must agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated;
 4. By the Grantee upon written notification setting forth the reasons for such termination, the effective date, and, in the case of partial termination, the portion to be terminated. However, if the Grantee determines in the case of partial termination that the reduced or modified portion of the contract will not accomplish the purposes for which the contract was made, the Grantee may terminate the contract in its entirety; or
 5. By the Grantee pursuant to termination provisions included in the SCIIP award.
- B. Administrative, Contractual, and Legal Remedies: In addition to any of the remedies described elsewhere in the contract, if the contractor materially fails to comply with the terms and conditions of this contract, including any federal or state statutes, rules or regulations, applicable to this contract, RIA or the Grantee may take one or more of the following actions:
1. Temporarily withhold payments pending correction of the deficiency by the contractor.
 2. Disallow (that is, deny both use of funds and any applicable matching credit for) all or part of the cost of the activity or action not in compliance.

3. Wholly or partly suspend or terminate this Contract.
 4. Take other remedies that may be legally available.
- C. The remedies identified above, do not preclude the contractor from being subject to debarment and suspension under Presidential Executive Orders 12549 and 12689. The Grantee shall have the right to demand a refund, either in whole or part, of the funds provided to the contractor for noncompliance with the terms of this Contract.
- 2.03 All contractors and sub-contractors are required to be registered in the federal System for Award Management (SAM) prior to the award of the Contract. The Contractor shall certify that it is not listed on the government-wide exclusions in SAM, in accordance with the OMB guidelines at 2 CFR 180 and 2 CF 1200 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.”
- 2.04 Bidders on this work will be required to comply with the President’s Executive Order No. 11246 & Order No. 11375 which prohibit discrimination in employment regarding race, creed, color, sex, or national origin. Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, the Contract Work Hours and Safety Standards Act, and 40 CFR 33.240.
- 2.05 The Contractor must comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each Contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. Requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.
- 2.06 The Contractor must comply with the Copeland “Anti-Kickback” Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each Contractor or subcontractor must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled.
- 2.07 Equal Opportunity Clause: During the performance of this contract, the contractor agrees as follows:
- A. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:
 1. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause. The contractor will, in all

solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

- B. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
 - C. The contractor will send to each labor union or representative of workers with which he has a collective bargaining contract or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
 - D. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
 - E. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
 - F. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
- 2.08 The contractor and its subcontractors agree to comply with certain provisions of the Contract Work Hours and Safety Standards Act, 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5).
- 2.09 The contractor and its subcontractors agree to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. 7401 et seq.
- 2.10 The contractor and its subcontractors agree to comply with all applicable standards, orders, and regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.
- 2.11 Contractors are responsible for complying with the US Government wide Requirements for Drug-Free Workplace set forth in 31 CFR Part 20.

- 2.12 In accordance with 2 CFR Part 180 and US Treasury’s implementing regulation at 31 CFR Part 19, SCIIP funds may not go to individuals or entities that are prohibited from doing business with the federal government.
- 2.13 Recipients of Federal financial assistance from the Treasury are required to meet legal requirements relating to nondiscrimination and nondiscriminatory use of Federal funds. Those requirements include ensuring that entities receiving federal financial assistance from the Treasury do not deny benefits or services, or otherwise discriminate on the basis of race, color, national origin (including limited English proficiency), disability, age, or sex (including sexual orientation and gender identity.) Statutes and regulations prohibiting discrimination applicable to this award include, without limitation, the following:
- 2.14 Bidders must also make positive efforts to use small and minority-owned business and to offer employment, training and contracting opportunities.
- 2.15 The specified materials listed in the Specifications are stated to establish standards of quality. Other manufacturer products may be provided if they are approved equal by the Engineer.

ARTICLE 3—BIDDING DOCUMENTS

- 3.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder’s responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.
- 3.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.
- 3.03 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are **required** to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder’s failure to obtain Addenda from a plan room.
- 3.04 *Electronic Documents*
 - A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.
 - 1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version DC or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor’s

means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

- B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.04.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 4—QUALIFICATIONS OF BIDDERS

- 4.01 If requested by Owner, successful bidder may be required to submit completed form EJCDC® C-451, Qualifications Statement (2018) with its Bid to demonstrate Bidder's qualifications to perform the Work.
- 4.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.
- 4.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 5—PRE-BID CONFERENCE

- 5.01 A non-mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference; however, attendance at this conference is not required to submit a Bid.
- 5.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 6—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

- 6.01 *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.
- 6.02 *Existing Site Conditions*
 - A. *Subsurface and Physical Conditions; Hazardous Environmental Conditions*

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:
 - a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.
 - b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.
 - c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.
 - d. Technical Data contained in such reports and drawings.
 2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.
 3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- 6.03 *Other Site-related Documents*
- A. No other Site-related documents are available.
- 6.04 *Site Visit and Testing by Bidders*
- A. A Site visit is scheduled following the pre-bid conference. Maps to the Site will be available at the pre-Bid conference.
- B. Bidders visiting the Site are required to arrange their own transportation to the Site.
- C. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the Owner or Engineer. Bidder must conduct the required Site visit during normal working hours.
- D. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.
- E. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on

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

- F. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.
- G. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

6.05 *Owner's Safety Program*

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

6.06 *Other Work at the Site*

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

ARTICLE 7—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

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

- A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.
- B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 8—INTERPRETATIONS AND ADDENDA

- 8.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.
- 8.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:
 - A. E-mail to Kara Hrkach at kara.hrkach@kci.com
- 8.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.
- 8.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract

Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 9—BID SECURITY

- 9.01 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.
- 9.02 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 10—CONTRACT TIMES

- 10.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.
- 10.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

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

ARTICLE 12—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.
- 12.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within five days after Bid opening.
- 12.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection

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

- 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 and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 13—PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents.
- A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.
 - B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."
- 13.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.
- 13.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.
- 13.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.
- 13.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.
- 13.06 A Bid by an individual must show the Bidder's name and official address.
- 13.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

- 13.08 All names must be printed in ink below the signatures.
- 13.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.
- 13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.
- 13.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.
- 13.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 14—BASIS OF BID

14.01 *Lump Sum*

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

14.02 *Base Bid with Alternates*

- A. Bidders must submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.
- B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form.

14.03 *Unit Price*

- A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.
- B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

ARTICLE 15—SUBMITTAL OF BID

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

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

- 15.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.
- 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 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.
- 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 15.01 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, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

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 also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

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

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

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

19.05 *Evaluation of Bids*

- A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a “Base Bid plus alternates” budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.
- C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the aggregate of the Bids for separate sections and the Bids for combined sections that result in the lowest total amount for all of the Work.
- D. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

- E. For the determination of the apparent low Bidder when cost-plus-fee bids are submitted, Bids will be compared on the basis of the Guaranteed Maximum Price set forth by Bidder on the Bid Form.
 - F. Bid prices will be compared after adjusting for differences in time of Substantial Completion (total number of calendar days to substantially complete the Work) designated by Bidders. The adjusting amount will be determined at the rate set forth in the Agreement for liquidated damages for failing to achieve Substantial Completion, or such other amount that Owner has designated in the Bid Form.
 - 1. The method for calculating the lowest bid for comparison will be the summation of the Bid price shown in the Bid Form plus the product of the Bidder-specified time of Substantial Completion in calendar days times the rate for liquidated damages in dollars per day.
 - 2. This procedure is only used to determine the lowest bid for comparison and contractor selection purposes. The Contract Price for compensation and payment purposes remains the Bid price shown in the Bid Form.
- 19.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.
- 19.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 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, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.
- 20.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 21—SIGNING OF AGREEMENT

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

SECTION 00410

Bid Form

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Oconee Joint Regional Sewer Authority
Flat Rock Pump Station Replacement

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

ARTICLE 1—OWNER AND BIDDER

- 1.01 This Bid is submitted to: **Oconee Joint Regional Sewer Authority, 623 Return Church Road, Seneca, SC 29678.**
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

- 2.01 The following documents are submitted with and made a condition of this Bid:
- A. Required Bid security;
 - B. List of Proposed Subcontractors;
 - C. List of Proposed Suppliers;
 - D. Evidence of authority to do business in the state of South Carolina; or a written covenant to obtain such authority within the time for acceptance of Bids;
 - E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;
 - F. Bidder Qualification Statement with supporting data, if requested.
 - G. Evidence of active SAM registration.
 - H. Non-Collusion Affidavit of Prime Bidder – Refer to Section 00604
 - I. Contractor Certification – Illegal Immigration – Refer to Section 00808

ARTICLE 3—BASIS OF BID

3.01 *Unit Price Bid Items*

A. Bidder agrees to perform all Work described in the specifications and shown on the plants for the following unit prices:

ARTICLE 4—BASE BID:

Item No.	Description	Quantity	Unit	Unit Price	Total
1.	Contractor Mobilization	1	LS	(5% Max. Total Bid)	\$
2.	Clearing/Grubbing	1	LS	\$	\$
3.	Demolition	1	LS	\$	\$
4.	Grading	1	LS	\$	\$
5.	Pre-Cast Concrete Wetwell Top & Valve Vault:	1	LS	\$	\$
6.	Wetwell Modifications	1	LS	\$	\$
7.	Bypass Pumping	1	LS	\$	\$
8.	2 New Submersible Pumps, Control Panel, and Level Control	1	LS	\$	\$
9.	Wetwell Aeration System	1	LS	\$	\$
10.	Flow Meter	1	LS	\$	\$
11.	Piping, Manholes, Valves and Appurtenances	1	LS	\$	\$
12.	Concrete Pads	1	LS	\$	\$
13.	Miscellaneous Metals	1	LS	\$	\$
14.	Chain Link Fencing and Gates	1	LS	\$	\$
15.	Crushed Stone Paving	100	SY	\$	\$
16.	Asphalt Paving	300	SY	\$	\$

**Section 00410
BID FORM**

Item No.	Description	Quantity	Unit	Unit Price	Total
17.	Retaining Wall	1	LS	\$	\$
18.	Electrical	1	LS	\$	\$
19.	Standby Generator System	1	LS	\$	\$
20.	Aluminum Canopy for Electrical	1	LS	\$	\$
21.	Gantry Crane	1	LS	\$	\$
22.	Silt Fencing	350	LF	\$	\$
23.	Sediment Tubes	6	EA	\$	\$
24.	Erosion Control Blanket	2,000	SF	\$	\$
25.	Construction Entrance	1	EA	\$	\$
26.	15" RCP Storm Pipe	20	LF	\$	\$
TOTAL BASE BID:					\$

4.01 *Total Base Bid Price*

Bidder agrees to perform all of the **Flat Rock Pump Station Replacement** project work as described in the specifications and on the plans for the total base bid price of:

_____ Dollars
 _____ Cents. (\$ _____).

ALTERNATE BID ITEMS:

A-1	Wetwell Coating	1	LS	\$	\$
A-2	Access Road Paving	250	SY	\$	\$

Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.

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The above unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

The Bidder declares that he understands that the quantities shown in the Proposal are subject to adjustment by either increase or decrease and that should the quantities of any of the items of the work be increased, the undersigned proposed to do the additional work at the unit prices stated herein, and should the quantities be decreased, he also understands that payment will be made on actual quantities at the unit price bid, and will make no claim for anticipated profits for any decrease in the quantities and that actual quantities will be determined upon completion of the work, at which time adjustment will be made to the contract amount by direct increase or decrease.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding. The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, Bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by the General Conditions.

By submission of this bid, each bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, that this bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this bid, with any other bidder or with any competitor.

ARTICLE 5—TIME OF COMPLETION

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

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

ARTICLE 6—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

6.01 *Bid Acceptance Period*

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

6.02 *Instructions to Bidders*

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

6.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 7—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

7.01 *Bidder’s Representations*

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

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder’s (Contractor’s) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

7.02 *Bidder's Certifications*

A. The Bidder certifies the following:

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

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

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

Attest:

(individual's signature)

Name:

(typed or printed)

Title:

(typed or printed)

Date:

(typed or printed)

Address for giving notices:

Bidder's Contact:

Name:

(typed or printed)

Title:

(typed or printed)

Phone:

Email:

Address:

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

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SECTION 00430

Bid Bond

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BID BOND (PENAL SUM FORM)

<p>Bidder Name: Address <i>(principal place of business)</i>:</p>	<p>Surety Name: Address <i>(principal place of business)</i>:</p>
<p>Owner Name: Oconee Joint Regional Sewer Authority Address <i>(principal place of business)</i>: 623 Return Church Road, Seneca, SC 29678</p>	<p>Bid Project <i>(name and location)</i>: Flat Rock Pump Station Replacement Bid Due Date: May 9, 2023</p>
<p>Bond Penal Sum: Date of Bond:</p>	
<p>Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.</p>	
<p>Bidder</p> <hr/> <p style="text-align: center;"><i>(Full formal name of Bidder)</i></p>	<p>Surety</p> <hr/> <p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____ <i>(Signature)</i></p>	<p>By: _____ <i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____ <i>(Printed or typed)</i></p>	<p>Name: _____ <i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____ <i>(Signature)</i></p>	<p>Attest: _____ <i>(Signature)</i></p>
<p>Name: _____ <i>(Printed or typed)</i></p>	<p>Name: _____ <i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><i>Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.</i></p>	

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

SECTION 00510

Notice of Award

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NOTICE OF AWARD

Date of Issuance:

Owner: Oconee Joint Regional Sewer Authority Owner's Project No.:
Engineer: KCI Technologies, Inc. Engineer's Project No.: 962205803
Project: Flat Rock Pump Station Replacement
Contract Name:
Bidder:
Bidder's

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:

Flat Rock Pump Station Replacement

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

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

Drawings will be delivered separately from the other Contract Documents.

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

1. Deliver to Owner **four (4)** counterparts of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any): _____

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

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

Owner: **Oconee Joint Regional Sewer Authority**

By (signature): _____

Name (printed): _____

Title: _____

Copy: Engineer

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SECTION 00520

Agreement

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

This Agreement is by and between the Oconee Joint Regional Sewer Authority (“Owner”) and _____ (“Contractor”).

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

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

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

- Demolition of existing wetwell, portions of the existing pump structure, radio antenna, fuel storage tanks, electrical components / controls, and other site features.
- Providing and installing new pumps, control panel, piping, valves, precast concrete structures, standby power generator, electrical wiring, conduit, and other items as shown on the plans.
- Installation of new gravity sewer and forcemain connections as shown on the plans.
- Bypass pumping during project construction.
- Site work including paving, graveling, fencing, retaining wall installation, and other features as shown on the plans.

ARTICLE 2—THE PROJECT

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

Replacement of the existing Flat Rock Pump Station with a new duplex submersible pump station and other upgrades as described previously.

ARTICLE 3—ENGINEER

3.01 The Owner has retained KCI Technologies, Inc. (“Engineer”) to act as Owner’s representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

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

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

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

4.02 *Contract Times: Days*

- A. The Work will be substantially complete within **180 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 **210 days** after the date when the Contract Times commence to run.

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 Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
1. *Substantial Completion:* Contractor shall pay Owner \$500 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.
 2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner \$500 for each day that expires after such time until the Work is completed and ready for final payment.
 3. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.
- B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 5—CONTRACT PRICE

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

- A. For all Work other than Unit Price Work, a lump sum of _____.

ARTICLE 6—PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

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

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 25th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted

in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.
 - a. 90 percent of the value of the Work completed (with the balance being retainage).
 - b. 90 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 Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

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

6.04 *Consent of Surety*

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

ARTICLE 7—CONTRACT DOCUMENTS

7.01 *Contents*

- A. The Contract Documents consist of all of the following:
 1. This Agreement.
 2. General Conditions.
 3. Supplementary Conditions.
 4. Specifications as listed in the table of contents of the project manual (copy of list attached).
 5. Drawings (not attached but incorporated by reference) consisting of 15 sheets with each sheet bearing the following general title: Flat Rock Pump Station Replacement, Oconee Joint Regional Sewer Authority, Walhalla, South Carolina.
 6. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
 - a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.

- d. Field Orders.
- e. Warranty Bond, if any.
- B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 7.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

- A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:
 - 1. Contractor has examined and carefully studied the Contract Documents, including Addenda.
 - 2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - 3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
 - 4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
 - 5. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.
 - 6. 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.
 - 7. 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.
 - 8. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

9. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
10. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:
 1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

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

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

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

Owner:

Oconee Joint Regional Sewer Authority

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

(If [Type of Entity] is a corporation, attach evidence of authority to sign. If [Type of Entity] is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)

Contractor:

(typed or printed name of organization)

By:

(individual's signature)

Date:

(date signed)

Name:

(typed or printed)

Title:

(typed or printed)

(If [Type of Entity] is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:

(individual's signature)

Title:

(typed or printed)

Address for giving notices:

Designated Representative:

Name:

(typed or printed)

Title:

(typed or printed)

Address:

Phone:

Email:

License No.:

(where applicable)

State:

SECTION 00550

Notice to Proceed

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NOTICE TO PROCEED

Owner: Oconee Joint Regional Sewer Authority Owner's Project No.: _____
Engineer: KCI Technologies, Inc. Engineer's Project No.: 962205803
Contractor: _____ Contractor's Project No.: _____
Project: Flat Rock Pump Station Replacement
Contract Name: _____
Effective Date of Contract: _____

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on _____ pursuant to Paragraph 4.01 of the General Conditions.

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

In accordance with the Agreement:

The number of days to achieve Substantial Completion for the Base Bid is **180 days** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of _____; and the number of days to achieve readiness for final payment is **210 days** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of _____.

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

Owner: Oconee Joint Regional Sewer Authority
By (signature): _____
Name (printed): _____
Title: _____
Date Issued: _____
Copy: Engineer

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SECTION 00604

Non-Collusion Affidavit

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NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

STATE OF _____)

COUNTY OF _____)

_____, being first duly sworn, deposes and says that:

- 1) He is _____ of _____, the Bidder that has submitted the attached bid;
- 2) He is fully informed respecting the preparation and contents of the attached bid and of all pertinent circumstances respecting such bid;
- 3) Such bid is genuine and is not a collusive or sham bid;
- 4) Neither the said bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other bidder, firm or person to submit a collusive or sham bid in connection with the Contract for which the attached bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other bidder, firm or person to fix the price or prices in the attached bid or of any other Bidder, or to fix any overhead, profit or cost element of the bid price or the bid price of any other bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Oconee Joint Regional Sewer Authority (Local Public Agency) or any person interested in the proposed Contract ; and
- 5) The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed) _____

(Title)

Subscribed and sworn to before me

this _____ day of _____, 20_____

(Title)

My commission expires: _____

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SECTION 00610

Performance Bond

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PERFORMANCE BOND

Contractor Name: Address (<i>principal place of business</i>):	Surety Name: Address (<i>principal place of business</i>):
Owner Name: Oconee Joint Regional Sewer Authority Mailing address (<i>principal place of business</i>): 623 Return Church Road Seneca, SC 29678	Contract Description (<i>name and location</i>): Flat Rock Pump Station Replacement Contract Price: Effective Date of Contract:
Bond Bond Amount: Date of Bond: (<i>Date of Bond cannot be earlier than Effective Date of Contract</i>) Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16	
Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.	
Contractor as Principal	Surety
_____ (<i>Full formal name of Contractor</i>)	_____ (<i>Full formal name of Surety</i>) (<i>corporate seal</i>)
By: _____ (<i>Signature</i>)	By: _____ (<i>Signature</i>)(<i>Attach Power of Attorney</i>)
Name: _____ (<i>Printed or typed</i>)	Name: _____ (<i>Printed or typed</i>)
Title: _____	Title: _____
Attest: _____ (<i>Signature</i>)	Attest: _____ (<i>Signature</i>)
Name: _____ (<i>Printed or typed</i>)	Name: _____ (<i>Printed or typed</i>)
Title: _____	Title: _____
Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.	

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SECTION 00615

Payment Bond

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PAYMENT BOND

<p>Contractor</p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>	<p>Surety</p> <p>Name: _____</p> <p>Address (<i>principal place of business</i>): _____</p>
<p>Owner</p> <p style="text-align: center;">Oconee Joint Regional Sewer Authority</p> <p>Name: Authority</p> <p>Mailing address (<i>principal place of business</i>):</p> <p>623 Return Church Road</p> <p>Seneca, SC 29678</p>	<p>Contract</p> <p>Description (<i>name and location</i>):</p> <p>Flat Rock Pump Station Replacement</p> <p>Contract Price: _____</p> <p>Effective Date of Contract: _____</p>
<p>Bond</p> <p>Bond Amount: _____</p> <p>Date of Bond: _____</p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form:</p> <p><input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.</p>	
Contractor as Principal	Surety
_____ <i>(Full formal name of Contractor)</i>	_____ <i>(Full formal name of Surety) (corporate seal)</i>
By: _____ <i>(Signature)</i>	By: _____ <i>(Signature)(Attach Power of Attorney)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
Attest: _____ <i>(Signature)</i>	Attest: _____ <i>(Signature)</i>
Name: _____ <i>(Printed or typed)</i>	Name: _____ <i>(Printed or typed)</i>
Title: _____	Title: _____
<p><i>Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.</i></p>	

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SECTION 00625

Certificate of Substantial Completion

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CERTIFICATE OF SUBSTANTIAL COMPLETION

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner: **Oconee Joint Regional Sewer Authority** Owner's Project No.:
Engineer: **KCI Technologies, Inc.** Engineer's Project No.: **962205803**
Contractor: Contractor's Project No.:
Project: **Flat Rock Pump Station Replacement**
Contract Name:

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 Documents.

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

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

Amendments to Owner's Responsibilities: None As follows:

Amendments to Contractor's Responsibilities: None As follows:

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

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

Engineer

By (signature): _____

Name (printed): _____

Title: _____

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SECTION 00626

Notice of Acceptability of Work

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NOTICE OF ACCEPTABILITY OF WORK

NOTICE OF ACCEPTABILITY OF WORK

Owner: **Oconee Joint Regional Sewer Authority** Owner's Project No.:
Engineer: **KCI Technologies, Inc.** Engineer's Project No.: **962205803**
Contractor: Contractor's Project No.:
Project: **Flat Rock Pump Station Replacement**
Contract Name:
Notice Date: Effective Date of the Construction Contract:

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated _____ ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By (signature): _____

Name (printed): _____

Title: _____

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SECTION 00700

Standard General Conditions

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**STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT**

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

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

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

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

Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

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

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

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

1.02 *Terminology*

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

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

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance

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

2.02 Copies of Documents

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

2.03 Before Starting Construction

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

performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Acceptance of Schedules*

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

2.06 *Electronic Transmittals*

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

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

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

3.02 *Reference Standards*

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

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

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

B. *Resolving Discrepancies*

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

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and

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

3.05 *Reuse of Documents*

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

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

4.02 *Starting the Work*

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

4.03 *Reference Points*

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

necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

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

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 - 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 - 2. Abnormal weather conditions;
 - 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 - 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
1. The circumstances that form the basis for the requested adjustment;
 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.
- Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

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

5.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to

be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

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

5.02 *Use of Site and Other Areas*

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

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

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

5.03 *Subsurface and Physical Conditions*

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

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

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

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

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

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

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

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
2. is of such a nature as to require a change in the Drawings or Specifications;

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

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

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- E. *Possible Price and Times Adjustments*
 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

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

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;
 3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any

Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

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

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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

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

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

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

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

5.06 *Hazardous Environmental Conditions at Site*

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

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

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

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

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

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

- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

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

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

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

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.
- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party’s full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party’s obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner’s option, may purchase and maintain Owner’s own liability insurance. Owner’s liability

- policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.
- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
1. include at least the specific coverages required;

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

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such

- property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.
1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured

is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

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

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at

Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

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

7.03 *Labor; Working Hours*

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

7.04 *Services, Materials, and Equipment*

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

7.05 “Or Equals”

- A. *Contractor’s Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an “or equal” item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
 - b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal,” which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request will result in any change in Contract Price. The Engineer’s denial of an “or-equal” request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

- A. *Contractor's Request; Governing Criteria:* Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer

- will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
 - D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
 - E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
 - F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may

- subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
 - G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
 - H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
 - I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
 - J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
 - K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
 - L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
 - M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

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

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

7.09 *Permits*

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

7.10 *Taxes*

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

7.11 *Laws and Regulations*

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

30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

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

7.13 *Safety and Protection*

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

- Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
 - H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
 - J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

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

7.15 *Emergencies*

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

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

- 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.
 3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
 1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.
5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted

or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

- c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.
 - d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;
 6. The issuance of a notice of acceptability by Engineer;
 7. The end of the correction period established in Paragraph 15.08;
 8. Any inspection, test, or approval by others; or
 9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

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

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

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

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

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

otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

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

8.02 *Coordination*

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

8.03 *Legal Relationships*

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

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

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

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

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

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

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

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

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

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

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.01 *Owner’s Representative*

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

10.02 *Visits to Site*

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

10.03 *Resident Project Representative*

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

10.04 *Engineer’s Authority*

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

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

10.05 *Determinations for Unit Price Work*

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

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

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

10.07 *Limitations on Engineer's Authority and Responsibilities*

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

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

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

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

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

10.08 *Compliance with Safety Program*

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

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 Amending and Supplementing the Contract

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

11.02 Change Orders

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

11.03 Work Change Directives

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

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

11.04 *Field Orders*

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

11.05 *Owner-Authorized Changes in the Work*

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

11.06 *Unauthorized Changes in the Work*

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

11.07 *Change of Contract Price*

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

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

11.08 *Change of Contract Times*

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

11.09 *Change Proposals*

A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

- 1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
- 2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

- 3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
- 4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter

to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision:* Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion:* Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

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

ARTICLE 12—CLAIMS

12.01 *Claims*

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

- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 Cost of the Work

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or

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incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis

of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price (“changed Work”), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder’s risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor’s fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

- C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:
1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 6. Expenses incurred in preparing and advancing Claims.
 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.
- E. *Documentation and Audit:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts,

vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

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

13.03 *Unit Price Work*

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

E. Adjustments in Unit Price

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

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

14.01 *Access to Work*

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

14.02 *Tests, Inspections, and Approvals*

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

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

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

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

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

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

15.01 *Progress Payments*

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

appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

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

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;

- b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
- a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

- e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

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

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

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

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
 - 2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

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

15.05 *Final Inspection*

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

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner

to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect

Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
 2. correct such defective Work;
 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

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

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

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

16.03 *Owner May Terminate for Convenience*

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

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

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:
1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 2. agree with the other party to submit the dispute to another dispute resolution process; or
 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

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

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

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

18.04 *Limitation of Damages*

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

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

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

18.09 *Successors and Assigns*

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

18.10 *Headings*

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

SECTION 00800

Supplementary Conditions

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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

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

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

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

SC-1.01.A. Add the following paragraph to the end of Section 1.01.A:

51. Regular Working Hours: Regular working hours for the project are defined as 8:00 am to 5:00 pm, Eastern Standard Time.

ARTICLE 2—PRELIMINARY MATTERS

2.06 *Electronic Transmittals*

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

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

1. *Basic Requirements*

- a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.
- b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
- c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
- d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the

requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

- e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.
- f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

- a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.
 - 1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 20 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.
 - 2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.
- b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.
- c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.
- d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the

changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

- e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.
- f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.
- g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

C. Software Requirements for Electronic Document Exchange; Limitations

- 1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.
 - a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.
- 2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.
- 3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

No suggested Supplementary Conditions in this Article.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.05 *Delays in Contractor's Progress*

SC-4.05 Add the following paragraphs after 4.05.G:

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- H. Time extension for weather delays due to rain shall only be considered for above average precipitation. NOAA Report No. 20 shall be used to determine the average number of days with precipitation greater than or equal to 0.10 inch for each month.
- I. Claims for additional Contract Time for delays beyond the Contractor's control shall be submitted in accordance with Article 10 of the General Conditions with the Contractor's monthly pay request. Submittal shall include the number of days requested and the reason for the delay. Engineer shall notify the Owner and Contractor of his decision in accordance with Article 10 of the General Conditions. Approval of time shall be included in a Change Order.

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

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

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

Report Title	Date of Report	Technical Data
Geotechnical Engineering Report – Flat Rock Lift Station, Walhalla, South Carolina	8/2/22	Three (3) boring logs around the pump station site.

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

Drawings Title	Date of Drawings	Technical Data
None	NA	NA

- G. Contractor may examine copies of reports and drawings identified in SC-5.03.E and SC-5.03.F that were not included with the Bidding Documents by requesting electronic copies, by e-mail, from Engineer.

5.05 *Underground Facilities*

SC-5.05.A. The following shall be added to paragraph 5.05.A:

6. Contractor shall follow the rules set forth by the South Carolina Underground Facility Damage Prevention Act.
7. Notifying owners of underground facilities prior to start of Work.
8. Investigating ahead of the Work to verify the existence of Underground Facilities.
9. Assuming risks and repairing damage caused by the Work to existing Underground Facilities whether indicated or not in the Contract Documents. Repairs to Underground Facilities shall be done to the satisfaction of the Underground Facility owner and may require material and methods, which are better than the existing Facility. Underground Facility owner reserves the

right to repair damage by the Contractor to their underground Facilities. If the Owner exercises this right, the owner's cost of this Work shall be deducted from the money due the Contractor.

10. Uncovering Underground Facilities, with that Owners approval, that are located within the Work as necessary for Engineer to determine the requirements for the change in the work.

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

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

Report Title	Date of Report	Technical Data
None	NA	NA

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

Drawings Title	Date of Drawings	Technical Data
None	NA	NA

SC-5.07 Add the following paragraph after Section 5.06:

5.07 Miscellaneous Site Conditions

The Contractor shall perform video inspections and take photographs of the proposed construction areas before disturbing the site in order to establish an accurate record of the pre-construction conditions for comparison to the final work. The Contractor shall provide the Owner with copies of all video and photographic records at the appropriate times (i.e., pre-construction and post-construction). The cost of video and photographic work shall be incidental to the contract and no separate payment will be made by the Owner.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2010, 2013, or 2018 edition).
2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2010, 2013, or 2018 edition).

6.03 *Contractor's Insurance*

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

D. Limits of liability for the insurance shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

Worker's Compensation, and related coverage:

State: Statutory - Per the Workers' Compensation Laws of the State of South Carolina.
Applicable Federal (e.g., Longshoremen's): Statutory
Employers Liability: \$500,000

E. Commercial General Liability, which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of the Contractor:

- | | |
|---|----------------|
| a. General Aggregate | \$2,000,000.00 |
| b. Products & Completed Operations Aggregate | \$1,000,000.00 |
| c. Personal & Advertising Injury | \$1,000,000.00 |
| d. Each Occurrence (Bodily Injury & Property Damage) | \$1,000,000.00 |
| e. Property Damage liability insurance will provide Explosion, Collapse, and Under-ground coverages where applicable. | |
| f. Excess or Umbrella Liability | |
| 1) General Aggregate | \$5,000,000.00 |
| 2) Each Occurrence | \$5,000,000.00 |

F. Automobile Liability:

- | | |
|-----------------------------|-----------------------------------|
| a. Bodily Injury: | |
| Each person | \$1,000,000.00 |
| Each Accident | \$1,000,000.00 |
| b. Property Damage: | |
| Each Accident | \$1,000,000.00 |
| | OR (i.e., either a. and b. or c.) |
| c. Combined Single Limit of | \$1,000,000.00 |

G. The Contractual Liability coverage shall provide coverage for not less than the following amounts:

- | | |
|---------------------|----------------|
| a. Bodily Injury: | |
| Each person | \$2,000,000.00 |
| Each Accident | \$2,000,000.00 |
| b. Property Damage: | |
| Each Accident | \$2,000,000.00 |
| Annual Aggregate | \$2,000,000.00 |

SC-6.04 Delete Paragraph 6.04.A of the General Conditions and substitute the following in its place:

A. *Installation Floater*

1. Contractor shall provide and maintain installation floater insurance on a broad form or "all risk" policy providing coverage for materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work ("Covered Property"). Coverage under

the Contractor's installation floater will include loss from covered "all risk" causes (perils) to Covered Property:

- a. of the Contractor, and Covered Property of others that is in Contractor's care, custody, and control;
 - b. while in transit to the Site, including while at temporary storage sites;
 - c. while at the Site awaiting and during installation, erection, and testing;
 - d. continuing at least until the installation or erection of the Covered Property is completed, and the Work into which it is incorporated is accepted by Owner.
2. The installation floater coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable.
 3. The installation floater coverage will be in an amount sufficient to protect Contractor's interest in the Covered Property. The Contractor will be solely responsible for any deductible carried under this coverage.
 4. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.03 Labor; Working Hours

SC-7.03 Add the following paragraphs after 7.03.C:

- D. Overtime Work: If Contractor's Work requires inspection as determined by the Engineer more than 10 hours in a work day or 40 hours in a work week, Monday through Friday excluding holidays, or on the weekends he shall submit a written request to the Engineer five (5) working days prior to the scheduled Work. Contractor shall pay for the Resident Project Representative's time beyond the above hours at the rate of \$75.00 / hour.
- E. The above will not prevent the Contractor from working outside the above time that will not require the inspector to be present. Such work may include; start up, clean up, seeding, painting (after the base surface has been approved by the inspector), and similar items. Contractor shall obtain approval of Work to be performed outside of the above work hours.
- F. Contractor shall not be charged for inspector's time for Work specifically identified by the Contract Documents to be performed outside the above Work time or on weekends.

7.11 Laws and Regulations

SC-7.11 Add the following paragraph(s) after 7.11.C:

- D. Contractor shall be responsible for conforming to the requirements of the approved sedimentation control plan and the local jurisdiction where the project is located as it relates to land disturbing activities undertaken by Contractor. Contractor shall be responsible to Owner for any fines imposed

on Owner as a result of Contractor's failure to comply with the above as it is further described in the Erosion Control Section of the Specifications.

- E. Should the Contractor cause the Owner to receive a Notice of Violation from a governmental agency, Contractor shall pay costs associated with Notice of Violation within ten (10) days of receipt of written notification. Costs shall include, but not be limited to:
1. Fines imposed on the Owner by the agency.
 2. Required legal newspaper publications concerning violation.
 3. Required mailings to customers concerning notification of violation.
 4. Administrative, engineering, and construction costs associated with resolving the Notice of Violation.
- F. Notice of Violation may include, but not be limited to, the following problems:
1. Sewage spill.
 2. Inadequate erosion control measures.
 3. Equipment failure during the warranty period.
 4. Failure of treatment facilities to meet treatment requirements.
- G. Contractor should be aware of N.C. Administrative Code T17:07B:0709 concerning sales tax on equipment in the purification processes.

7.12 *Record Documents*

SC-7.12 Add a new paragraph after paragraph 7.12.A:

- B. Record Documents shall be updated daily. Should the Engineer determine that the Record Documents are not being properly maintained, approval of future payment requests shall be withheld.

ARTICLE 8—OTHER WORK AT THE SITE

No suggested Supplementary Conditions of this article.

ARTICLE 9—OWNER'S RESPONSIBILITIES

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

9.13 *Owner's Site Representative*

- A. Owner will furnish an "Owner's Site Representative" to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner's Site Representative is not Engineer's consultant, agent, or employee. Owner's Site Representative will be Ethan Williams/Wastewater Collection System ORC.

ARTICLE 10—ENGINEER’S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

SC-10.03 Add the following new subparagraph immediately after Paragraph 10.03.A:

1. On this Project, by agreement with the Owner, the Engineer will not furnish a Resident Project Representative to represent Engineer at the Site or assist Engineer in observing the progress and quality of the Work.

ARTICLE 11—CHANGES TO THE CONTRACT

11.08 *Change of Contract Times*

SC-11.08 Add the following paragraph after 11.08.B:

- C. Time Extension: Contract time extensions for weather delays do not entitle Contractor to “extended overhead” recovery.

ARTICLE 12—CLAIMS

No suggested Supplementary Conditions in this Article.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

No suggested Supplementary Conditions in this Article.

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

No suggested Supplementary Conditions in this Article.

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

15.01 *Progress Payments*

SC-15.01.B Add the following new paragraph after paragraph 15.01.B.4:

5. The Application for Payment form to be used on this project is EJCDC Document C-620. The Owner must approve all Applications for Payment before payment is made.

SC-15.01.D Delete paragraph 15.01.D.1 in its entirety.

15.03 *Substantial Completion*

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

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

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ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

No suggested Supplementary Conditions in this Article.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

17.02 *Arbitration*

- A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of \$100,000 or less will be settled in accordance with the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.
- B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.
- C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.
- D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.
- E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.
- F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.
- G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;
 2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;
 3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and
 4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.
- H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.
- I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02..

17.03 *Attorneys' Fees*

- A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

ARTICLE 18—MISCELLANEOUS

No suggested Supplementary Conditions in this Article.

SECTION 00808

Contractor Illegal Immigration Certification

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**SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT
CONTRACTOR CERTIFICATION**

02/2017

**SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT
CONTRACTOR CERTIFICATION**

In accordance with the requirements of the South Carolina Illegal Immigration Reform Act, _____ (“Contractor”) hereby certifies that it is currently in compliance with the requirements of Title 8, Chapter 14 of the S.C. Code Annotated and will remain in compliance with such requirements throughout the term of its contract with the Oconee Joint Regional Sewer Authority (“Owner”).

Contractor hereby acknowledges that in order to comply with requirements of S.C. Code Annotated Section 8-14-20(B), it will:

1. Register and participate in the federal work authorization program (E-Verify) to verify the employment authorization of all new employees; and require agreement from its subcontractors, and through the subcontractors, the sub-subcontractors, to register and participate in the federal verification the employment authorization of all new employees.

Contractor agrees to provide to Owner any documentation required to establish the applicability of the South Carolina Illegal Immigration Reform Act to the Contractor, subcontractor, or sub-subcontractor. Contractor further agrees that it will provide Owner with any documentation required to establish that the Contractor and any subcontractors or sub-subcontractors are in compliance with the requirements of Title 8, Chapter 14 of the S.C. Code Annotated.

Date: _____

By: _____

Title: _____

**SOUTH CAROLINA ILLEGAL IMMIGRATION REFORM ACT
CONTRACTOR CERTIFICATION**

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SECTION 00940

Work Change Directive

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WORK CHANGE DIRECTIVE NO.: _____

Owner: **Oconee Joint Regional Sewer Authority** Owner's Project No.:
Engineer: **KCI Technologies, Inc.** Engineer's Project No.: **962205803**
Contractor: Contractor's Project No.:
Project: **Flat Rock Pump Station Replacement**
Contract Name:
Date Issued: Effective Date of Work Change Directive:

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

Description:

Attachments:

Purpose for the Work Change Directive:

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

Notes to User—Check one or both of the following

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

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

Contract Price: \$ _____

Contract Time: _____ days

Basis of estimated change in Contract Price:

Lump Sum Unit Price Cost of the Work Other

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

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SECTION 00941

Change Order

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CHANGE ORDER NO.: _____

Owner: **Oconee Joint Regional Sewer Authority** Owner's Project No.:
 Engineer: **KCI Technologies, Inc.** Engineer's Project No.: **962205803**
 Contractor's Project
 Contractor: No.:
 Project: **Flat Rock Pump Station Replacement**
 Contract Name:
 Date Issued: Effective Date of Change Order:

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

Description:

Attachments:

Change in Contract Price	Change in Contract Times
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. \$ _____	[Increase] [Decrease] from previously approved Change Orders No.1 to No. Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: \$ _____	[Increase] [Decrease] this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

<p>Recommended by Engineer (if required)</p> <p>By: _____</p> <p>Title: _____</p> <p>Date: _____</p> <p>_____ Authorized by Owner</p> <p>By: _____</p> <p>Title: _____</p> <p>Date: _____</p>	<p>Authorized by Owner</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____ Approved by Funding Agency (if applicable)</p> <p>_____</p> <p>_____</p> <p>_____</p>
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SECTION 00942

Field Order

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FIELD ORDER NO.: _____

Owner: **Oconee Joint Regional Sewer Authority** Owner's Project No.:
Engineer: **KCI Technologies, Inc.** Engineer's Project No.: **962205803**
Contractor: Contractor's Project No.:
Project: **Flat Rock Pump Station Replacement**
Contract Name:
Date Issued: Effective Date of Field Order:

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

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

Attachments:

Issued by Engineer

By: _____

Title: _____

Date: _____

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DIVISION 1
GENERAL REQUIREMENTS

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PART 1 - GENERAL

1.1 LOCATION OF WORK

- A. All of the work of this Contract shall be installed at locations shown on the drawings.

1.2 SCOPE OF WORK

- A. The Contractor shall furnish all labor, materials, equipment, tools, services and incidentals to complete all work required by these specifications and as shown on the drawings.
- B. The Contractor shall perform the work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, clean-up, replacements and restoration required as a result of damages caused during this construction.
- C. All materials, equipment, skills, tools and labor which are reasonable and properly inferable and necessary for the proper completion of the work in a substantial manner and in compliance with the requirements stated or implied by these specifications or drawing shall be furnished and installed by the Contractor without additional compensation, whether specifically indicated in the contract documents or not.
- D. The Contractor shall comply with all municipal, county, state, federal, and other codes which are applicable to the proposed construction work.

1.3 GENERAL DESCRIPTION OF WORK TO BE PERFORMED

- A. Furnish all labor, materials, equipment and incidentals required and construct the Flat Rock Pump Station Replacement project as shown on the drawings and specified herein.
- B. The work includes, but is not necessarily limited to, the following:
 - 1. Demolition of existing wet well, portions of existing pump structure, radio antenna, pumps, miscellaneous electrical equipment, and all other items as shown on the plans.
 - 2. Furnishing and installing new submersible pumps, control panel, standby power generator, magnetic flow meter, miscellaneous piping and appurtenances, electrical work, standby diesel power generator, and all other items as shown on the plans.
 - 3. Installation of gravity sewer and forcemain piping, including connections to existing piping, as show on the plans.
 - 4. Miscellaneous site improvements including grading, paving, fencing, a new retaining wall, sediment and erosion control, lighting, and all other items as shown on the plans and as needed for a complete installation.

1.4 WORK SEQUENCE

- A. All work to be done under this contract shall be done with minimum inconvenience to the existing wastewater collection lines and roadway traffic flow.
- B. Coordinate the construction schedule and operations with the Owner's representative.
- C. Refer to the recommended sequence of construction on the project plans.

1.5 CONSTRUCTION AREAS

- A. Contractor shall limit his use of the construction areas for work and for storage, to allow for:
 - 1. Work by other contractors.
 - 2. Owner use.
- B. Assume full responsibility for the protection and safekeeping of products under this contract, stored on the site.
- C. Move and store products, under Contractor's control which interfere with operations of the Owner or separate Contractor.
- D. Obtain and pay for the use of additional storage or work areas needed for operations.

1.6 PLANS AND SPECIFICATIONS

- A. The technical specifications consist of three parts: General, Products, and Execution. The General Section contains General Requirements which govern the work. Products and Execution modify and supplement the General Requirements. The Products and Execution parts shall always govern whenever there appears to be a conflict.
- B. Intent

All work called for in the specifications applicable to this contract, but not shown on the plans in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the plans or in the specifications but involved in carrying out their intent or in the complete and proper execution of the work, is required and shall be performed by the Contractor as though were specifically delineated or described.

The apparent silence of the specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these specifications shall be made upon that basis. The inclusion of the General Requirements (or work specified elsewhere) in the general part of the specifications is only for the convenience of the Contractor, and shall not be interpreted as a complete list of related specification sections.

1.7 OWNER OCCUPANCY

Owner will have full access to and use of all existing wastewater conveyance facilities. Cooperate with Owner's representative in all construction operations to minimize conflict and to facilitate Owner usage.

1.8 PARTIAL OWNER OCCUPANCY

Whenever, in the opinion of the Engineer, any section or portion of the work or any structure is in suitable condition, it may be put into use upon the written order of the Engineer and such usage will not be held in any way as an acceptance of said Work or structure, or any part thereof, or as a waiver of any of the provisions of the specifications and the contract. Pending final completion and acceptance of the Work, all necessary repairs and replacement, due to defective materials or workmanship or operations of the Contractor, for any section of the work so put into use shall be performed by the Contractor at Contractor's own expense.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION

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PART 1 - GENERAL**1.1 SCOPE**

- A. The bid form lists each item of the project for which payment will be made. No payment will be made for any items other than those listed in the bid form.
- B. Required items of work and incidentals necessary for the satisfactory completion of the Work which are not specifically listed in the bid, and which are not specified in this section to be measured or to be included in one of the items listed in the bid, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the lump sum or unit prices bid for the various bid items. The Contractor shall prepare the bid accordingly.
- C. Work includes furnishing all labor, equipment, tools and materials, that are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the drawings.

1.2 GENERAL PROVISIONS

- A. Measurement of an item of work will be by the unit indicated in the bid.
- B. Final payment quantities shall be determined from the record drawings. The record drawing lengths, dimensions, quantities, etc. shall be determined by a survey after the completion of all required work. Said survey shall conform to Section 01720 of these specifications. The precision of final payment quantities shall match the precision shown for that item in the bid.
- C. Payment will include all necessary and incidental related work not specified to be included in any other item or work listed in the bid.
- D. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all permits, labor, equipment, tools and materials not furnished by the Owner and for performing all operations required to provide to the owner the entire project, complete in place, as specified and as indicated on the drawings.
- E. No separate payment will be made for any item of work, materials, parts, equipment, supplies or related items required to perform and complete the work. The costs for all such items required shall be included in the price bid for item of which it is a part. The Bid Form is provided for the Contractor's convenience and to assign values to the work to be performed. No separate payment shall be made for incidental work required in the contract documents. The total bid amount shall be all inclusive of the work to be performed, in place, complete, and accepted. No separate payment shall be made for any work not specifically listed on the Bid Form, but required to perform the work in the bid documents. This work will be considered incidental to the performance of the contract.
- F. "Products" shall mean materials or equipment permanently incorporated into the work.

PART 2 – MEASUREMENT AND PAYMENT

This section is the basis for payment for work to be completed under the items listed in the Bid. Each amount shall include all labor, materials, tools, surface restoration, cleanup, construction staking, equipment, transportation, overhead, profit, insurance, taxes and all other costs necessary for a complete installation and placement in service of the work. No additional compensation will be considered, except for work approved by the Owner as a change to the work as bid.

Payment for all items shall be full compensation for mobilization and demobilization; seeding and grassing; site restoration; spare parts; testing; startup services; cleanup; “as-built” drawings; warranties; and all other related work necessary for a complete and proper installation.

1. CONTRACTOR MOBILIZATION:

Mobilization shall be paid for at the lump sum amount established in the bid and shall include all costs associated with the cost of insurance; payment and performance bonds; the contractor's cost of moving personnel and equipment to the project site; contractor's facilities on site; project signs; and other incidentals incurred prior to beginning actual construction of the project.

Payment for the cost of mobilization shall be limited to a maximum of five (5%) percent of the total contract amount. The amount of mobilization as listed in the Bid shall not be reduced in determining the total Bid amount.

2. CLEARING/GRUBBING:

Work performed under this bid item shall be paid for at the lump sum amount as established in the bid and shall include all costs associated with clearing and grubbing at the pump station site as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Clearing and grubbing operations at the pump station site to the limits shown on the plans.
- Removal and proper disposal of clearing debris (no burning allowed).
- Clean-up of the construction site.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

3. DEMOLITION:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with the piping and structure demolition at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Demolition, removal, and disposal of the existing piping that are indicated on the plans.
- Demolition, removal, and disposal of the existing electrical wiring, conduit, panels, and controls as indicated on the plans.
- Demolition, removal and disposal of the existing generator, fuel storage tanks, fencing, paving, and radio antenna as indicated on the plans.

- Demolition, removal and disposal of the top level and interior floors of the existing pump structure as indicated on the plans.
- Demolition, removal and disposal of the existing wetwell as indicated on the plans.
- Removal and proper disposal of construction debris and unsuitable materials.
- Clean-up of the construction site.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

4. GRADING:

Work performed under this bid item shall be paid for at the lump sum price for the site grading and shall include all costs associated with grading the site as shown on the plans and described in the specifications. The unit price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications.
- Unclassified excavation and properly compacted backfill.
- Removal and disposal of unsuitable materials.
- Providing and installing select fill material (if required).
- Removal of excess material (if required).
- General surface restoration of disturbed areas of construction.
- Temporary and permanent grassing.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

5. PRE-CAST CONCRETE WETWELL TOP AND VALVE VAULT:

Work performed under this bid item shall be paid for at the lump sum price for the installation of the Pre-Cast Concrete Wetwell Top and Valve Vault and shall include all costs associated with providing and installing the units as shown on the plans and described in the specifications. The unit price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.
- Unclassified excavation and properly compacted backfill.
- Removal and disposal of unsuitable materials.
- Providing and installing select backfill material.
- Providing and installing the new pre-cast wetwell top and valve vault structures and accessories.
- Grout slopes inside the valve vault.
- Link Seals, pipe boots, and watertight grouting of the piping connections.
- Joint wraps.
- Bedding as required.
- Dewatering of the excavation.
- Hydraulic testing.
- Grouting joints, etc. with non-shrink grout.

- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

6. WETWELL MODIFICATIONS:

Work performed under this bid item shall be paid for at the lump sum price for the installation of the wetwell modifications and shall include all costs associated with completing the modifications as shown on the plans and described in the specifications. The unit price shall include (but not be limited to) the following items:

- Providing and installing structural reinforcement within the wetwell structures as shown on the project plans.
- Providing and installing bypass pipe, base elbow, and suction connection as shown on the project plans.
- Grout slopes inside the wetwell.
- Link Seals, pipe boots, and watertight grouting of the piping connections.
- Hydraulic testing.
- Grouting joints, etc. with non-shrink grout.
- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

7. BYPASS PUMPING:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with bypass pumping at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Providing, installing, operating, and maintaining the bypass pumping systems as required to keep the pump station in service during the installation of the proposed improvements.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

8. 2 NEW SUBMERSIBLE PUMPS, CONTROL PANEL, AND LEVEL CONTROL:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with providing and installing 2 new submersible pumps with associated control panel, RTU, and level controls as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying pump station dimensions in the field.
- Daily clean-up of the construction site.
- Providing and installing the new pumps, guide rails, bases, and associated accessories.
- 316 SSDL anchor bolts.
- Grouting the pump bases inside the wetwell.

- Pipe supports.
- Providing and installing the new pump control panel, floats, and associated accessories.
- Providing and installing the supports, anchors, wiring, conduit, strain relief, and other appurtenances as shown on the plans and specified.
- Providing and installing the RTU/Monitoring equipment, conduit/wiring, panels, racks/poles, and associated equipment for the new pump station.
- Coordination with Owner SCADA/monitoring system provider.
- Equipment start-up and warranties.\
- Coordinating the Equipment start-up with the supplier.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

9. WETWELL AERATION SYSTEM:

Work performed under this bid item shall be paid for at the lump sum price for the wetwell aeration system and shall include all costs associated with providing and installing the units as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.
- Providing and installing the wetwell aeration system and associated accessories.
- 316 stainless steel anchor bolts as required to fasten unit to the concrete pad.
- Piping and coupling connections.
- Pipe supports.
- Coring the wetwell tops for the piping and installing link seals and watertight grout.
- Providing and installing the electrical equipment, wiring, panels, and associated equipment.
- Equipment start-up and warranties.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

10. FLOW METER:

Work performed under this bid item shall be paid for at the lump sum price for the flow meter and shall include all costs associated with providing and installing the unit as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.
- Providing and installing the flow meter and associated accessories.
- Grout slope inside the vault.
- Link Seals, pipe boots, and watertight grouting of the piping connections.
- 316 stainless steel anchor bolts as required.
- Piping and coupling connections.
- Providing and installing the electrical equipment, wiring, panels, and

associated equipment.

- Painting.
- Equipment start-up and warranties.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

11. PIPING, MANHOLES, VALVES, AND APPURTENANCES:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with providing and installing the piping, manholes, valves, and appurtenances at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying piping dimensions in the field.
- Daily clean-up of the construction site.
- Unclassified excavation and properly compacted backfill.
- Removal and disposal of unsuitable materials.
- Providing and installing select backfill material.
- Pipe and manhole bedding as required.
- PVC pipe, Ductile Iron pipe (with Protecto 401 interior coating), and fittings as specified.
- Pre-Cast Concrete Manholes, including frame/cover, and all accessories.
- Providing and installing all plugs and thrust blocking on abandoned piping.
- Pipe restraint systems.
- Couplings.
- Locate wire.
- Piping connections to the existing forcemain piping.
- Providing and installing all valves (plug, check, gate, and surge relief).
- Bypass pumping connection.
- Yard hydrants.
- Backflow Preventor Assembly including the enclosure and concrete pad. This will also include the testing of the backflow assembly.
- Pipe supports.
- Pressure Gauges and associated taps, SSTL piping, and ball valves.
- Pipe installation and jointing of pipe.
- Pressure testing of piping.
- Vacuum testing of manholes.
- SSTL vent piping for wetwells, valve vaults, and flow meter vault (as indicated on plans).
- Dewatering of trench excavation.
- General surface restoration of disturbed areas of construction.
- Temporary and permanent grassing.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

12. CONCRETE PADS:

Work performed under this bid item shall be paid for at the lump sum price for the installation of the poured in place concrete pads, foundations, and sidewalks and shall include all costs associated with providing the concrete as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.
- Unclassified excavation and properly compacted backfill.
- Providing and installing the poured-in-place concrete.
- Steel, wire, and fiber reinforcement as specified and required.
- Installation and removal of forms.
- Stone bedding where shown on the plans and details.
- Concrete finishing and sealants.
- Installation of control/expansion joints and accessories.
- Water stops as required.
- Preparation of concrete cylinders by an approved testing company as specified.
- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

13. MISCELLANEOUS METALS:

Work performed under this bid item shall be paid for at the lump sum as established in the bid and shall include all costs associated with miscellaneous metals at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Providing and installing new aluminum hatches (as indicated on the plans).
- Providing and installing new sign for the pump station.
- Providing and installing aluminum grating (as indicated on the plans).
- Cast iron drain grates and frames.
- All anchors, bolts, straps, hangers, unistrut, etc. not specifically covered by other bid items.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

14. CHAIN LINK FENCING AND GATES:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with the chain link fencing and gates for the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Providing and installing the new chain link fencing and accessories.
- New concrete for posts as required.
- Providing and installing 3 strands of barbed wire around the entire perimeter

of the pumps station fencing.

- Providing and installing new gates, gate hardware/latches, and accessories as required.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

15. CRUSHED STONE PAVING:

Work performed under this bid item shall be paid for at the unit price per square yard as established in the bid and shall include all costs associated with the crushed stone paving installed at the pump station as shown on the plans and described in the specifications. The unit price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications.
- Fine grading.
- Providing and installing the Filter Fabric Underlay Material.
- 6" compacted crushed stone paving.
- Proof rolling.
- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

16. ASPHALT PAVING:

Work performed under this bid item shall be paid for at the unit price per square yard as established in the bid and shall include all costs associated with the asphalt paving installed at the pump station as shown on the plans and described in the specifications. The unit price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications.
- Fine grading and compacted base course.
- 2" roller compacted asphalt intermediate course.
- 2" roller compacted asphalt surface coarse including tack.
- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

17. RETAINING WALL:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with the installation of a new retaining wall at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.

- Unclassified excavation and properly compacted backfill.
- Providing and installing the poured-in-place concrete.
- Steel, wire, and fiber reinforcement as specified and required.
- Installation and removal of forms.
- Stone bedding where shown on the plans and details.
- Concrete finishing and sealants.
- Installation of control/expansion joints and accessories.
- Water stops as required.
- Preparation of concrete cylinders by an approved testing company as specified.
- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

18. ELECTRICAL:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with new electrical systems installed at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying existing electrical systems in the field.
- Unclassified excavation and properly compacted backfill.
- Providing and installing select backfill material.
- Providing and installing the electrical equipment, conduit/wiring, panels, racks/poles, and associated equipment.
- Labeling of panels.
- Hazard/Danger warning signs and labels.
- Equipment start-up and warranties.
- Coordination with electrical power provider (Duke).
- Coordination with Owner SCADA/monitoring system provider.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

19. STANDBY GENERATOR SYSTEM:

Work performed under this bid item shall be paid for at the lump sum price as established in the bid and shall include all costs associated with installing the standby generator systems at the pump station as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying pump station dimensions in the field.
- Providing and installing the new generator set and automatic transfer switch (ATS) and associated accessories.
- 316 SSTL anchor bolts.
- Providing and installing the electrical wiring, conduit, panels, and associated equipment.
- Making the wiring connections and terminations required.

- Coordinating the Equipment start-up with the supplier
- Coordination with Owner SCADA/monitoring system provider.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

20. ALUMINUM CANOPY FOR ELECTRICAL:

Work performed under this bid item shall be paid for at the lump sum price for the aluminum canopy for the electrical controls and shall include all costs associated with providing and installing the canopy as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.
- Providing and installing the aluminum canopy and associated accessories.
- 316 stainless steel anchor bolts as required to fasten unit to the concrete pad.
- Concrete foundations for post supports.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

21. GANTRY CRANE:

Work performed under this bid item shall be paid for at the lump sum price for the gantry crane located over the wetwell and shall include all costs associated with providing and installing the crane as shown on the plans and described in the specifications. The lump sum price shall include (but not be limited to) the following items:

- Field investigation work as outlined on the Contract Drawings and in the Specifications. Verifying dimensions in the field.
- Fabricating and installing the steel gantry crane.
- Providing and installing associated accessories, including the chain hoist and associated lifting equipment.
- 316 stainless steel anchor bolts as required to fasten unit to the concrete foundations.
- Concrete foundations for post supports.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

22-25. EROSION & SEDIMENT CONTROL FACILITIES:

- A. Silt fencing shall be paid for at the unit price per linear foot established in the bid and shall include all costs associated with providing, installing, maintaining, and removal of the silt fence in accordance with the contract drawings and specifications or as directed by the Engineer.
- B. Sediment tubes shall be paid for at the unit price per each established in the bid and shall include all costs associated with providing, installing, maintaining, and removal of the protection devices as required by the contract specifications and drawings. The Engineer shall confirm the location and type of protective device required.
- C. Erosion Control Blanket (ECB) shall be paid for at the unit price per square foot established in the bid and shall include all costs associated with providing, installing,

maintaining the ECB in accordance with the contract drawings and specifications or as directed by the Engineer.

- D. Construction Entrances shall be paid for at the unit price per each entrance as established in the bid and shall include all costs associated with providing, installing, maintaining, and removal of the construction entrance as required by the contract specifications and drawings. The Engineer shall confirm the location of the construction entrance.

26. STORM DRAINAGE PIPING:

The Work performed under this bid item shall be paid for at the unit price per linear foot established in the bid for the various line sizes and depths and shall include all costs associated with installing the RCP storm drainage lines by the open cut trench method. The unit price shall include, at a minimum, the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the Specifications
- Providing and installing the RCP Pipe.
- Unclassified excavation and properly compacted backfill.
- Removal and disposal of unsuitable materials.
- Providing and installing select backfill material.
- Pipe bedding as required.
- Dewatering of trench excavation
- Surface restoration of disturbed areas of construction
- Other work as required for a complete and proper installation and compliance with the Contract Documents

A-1. WETWELL COATING:

Work performed under this bid item shall be paid for at the lump sum price for the installation of a polymer wetwell coating system and shall include all costs associated with completing installing the coating as shown on the plans. The unit price shall include (but not be limited to) the following items:

- Preparation of the existing concrete surface per manufacturer specifications to accept the polymer coating.
- Coating of the entire interior of the new wetwell structure after all modifications have been completed.
- Testing and inspection by the coating manufacturer and / or applicator.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

A-2. ACCESS ROAD PAVING:

Work performed under this bid item shall be paid for at the unit price per square yard as established in the bid and shall include all costs associated with milling and re-paving the existing asphalt access road to the pump station. The unit price shall include (but not be limited to) the following items:

- All field engineering and survey work
- Field investigation work as outlined on the Contract Drawings and in the

Specifications.

- Milling of existing asphalt surface.
- 2” roller compacted asphalt surface coarse including tack.
- General surface restoration of disturbed areas of construction.
- Other work as required for a complete and proper installation and compliance with the Plans and Contract Documents/Specifications.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

- A. Construction staking shall include all surveying work required to layout the work and control the location of the finished project. The Contractor shall have the full responsibility for constructing the project to the correct horizontal and vertical alignment, as shown on the drawings, as specified, or as ordered by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- B. From the information shown on the drawings and the information to be provided as indicated under project conditions below, the Contractor shall:
 - 1. Be responsible for setting reference points and/or offsets, establishment of baselines and all other layout, staking, and all other surveying required for the construction of the project.
 - 2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
 - 3. Stake out the permanent and temporary easements or the limits of construction to ensure that the work is not deviating from the indicated limits.
 - 4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
- C. Baselines shall be defined as the line to which the location of the work is referenced; i.e., edge of pavement, road centerline, property line, right-of-way or survey line.
- D. Record drawing surveys shall be performed in accordance with Section 01720 of these specifications.

1.2 PROJECT CONDITIONS

- A. The drawings provide the location and/or coordinates of principal components of the project. The alignment of some components of the project may be indicated in the specifications. The Engineer may order changes to the location of some of the components of the project or provide clarification to questions regarding the correct alignment.
- B. The Owner's Surveyor will provide the following:
 - 1. Vertical control points, with elevation, as shown on the plans.
 - 2. Horizontal control points, with coordinates, as shown on the plans.

1.3 QUALITY ASSURANCE

- A. The level of detail of survey required shall be that from which the correct location of the pipeline or appurtenances can be established for the construction and verified by the Engineer.
- B. Any deviations from the drawings shall be confirmed by the Engineer prior to construction of that portion of the project.

PART 2 - PRODUCTS

The contractor shall provide all equipment and field supplies, including but not limited to, stakes, hubs, PK nails, flagging, paint, etc. necessary to perform construction staking.

PART 3 - EXECUTION

3.1 STAKING PRECISION

The precision of construction staking required shall be that from which the correct location and elevation of the water line, gravity sanitary sewer or sanitary sewer force main can be established for construction and verified by the Engineer. Where the location of components of the gravity sanitary sewer, (e.g. fittings, road crossings, manholes) are not dimensioned, the establishment of the location of these components shall be based upon scaling these locations from the drawings with relation to survey reference points.

3.2 REFERENCE POINTS

- A. Reference points shall be placed, at or no more than three feet from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use, prior to verifying reference point locations. Distances shall be accurately measured to 0.01 foot.
- B. The Contractor shall give the Engineer reasonable notice that reference points are set. The reference point locations must be verified by the Engineer prior to commencing clearing and grubbing operations.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

A. Permits and Responsibilities

The Contractor shall, at no additional cost to the Owner, be responsible for obtaining all necessary licenses and permits, including building permits, and for complying with any applicable federal, state, county and municipal laws, ordinances, codes and regulations, in connection with the performance of the work. Copies of permits already obtained by the Owner will be provided no later than the pre-construction conference.

B. The Contractor shall take proper safety and health precautions to protect the work, the workers, the public and the property of others.

C. Prior to commencing any work, the Contractor shall submit a job-specific Health and Safety Plan to the Owner for their records.

D. Contractor shall provide inspection of sediment and erosion control measures required by the NPDES General Permit for Stormwater Discharges, SCR10000, and as described in the Stormwater Pollution Prevention Plan for the project. The Contractor shall be listed as a co-permittee in the Notice of Intent for coverage under the permit and shall sign the required certification for co-permittees.

E. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the work.

F. The Contractor shall post a copy of the construction permit in a conspicuous location on site.

END OF SECTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, or specification adopted and published at the time of advertisement for bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment for which a UL Standard, an AGA or NSF approval, or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this project are not necessarily restricted to those organizations which are listed in Article 1.02.

1.2 STANDARD ORGANIZATIONS

A. Piping and Valves

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute
MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
	Uni-Bell PVC Pipe Association

B. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials

C. Painting and Surface Preparation

NACE National Association of Corrosion Engineers
SSPC Steel Structures Painting Council

D. Aluminum

AA Aluminum Association
AAMA American Architectural Manufacturers Association

E. Steel and Concrete

ACI American Concrete Institute
AISC American Institute of Steel Construction, Inc.
AISI American Iron and Steel Institute
CRSI Concrete Reinforcing Steel Institute
NRMA National Ready-Mix Association
PCA Portland Cement Association
PCI Prestressed Concrete Institute

F. Welding

ASME American Society of Mechanical Engineers
AWS American Welding Society

G. Government and Technical Organizations

AIA American Institute of Architecture
APHA American Public Health Association
APWA American Public Works Association
ASA American Standards Association
ASAE American Society of Agricultural Engineers
ASCE American Society of Civil Engineers
ASQC American Society of Quality Control
ASSE American Society of Sanitary Engineers
CFR Code of Federal Regulations
CSI Construction Specifications Institute
EDA Economic Development Administration
EPA Environmental Protection Agency
FCC Federal Communications Commission
FmHA Farmers Home Administration
FS Federal Specifications
IAI International Association of Identification
ISEA Industrial Safety Equipment Association
ISO International Organization for Standardization
ITE Institute of Traffic Engineers
NBFU National Board of Fire Underwriters
(NFPA) National Fire Protection Association
NBS National Bureau of Standards
NISO National Information Standards Organization
OSHA Occupational Safety and Health Administration

SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

H. Roadways

AREA	American Railway Engineering Association
DOT	Department of Transportation

I. Plumbing

AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

1.3 SYMBOLS

Symbols and material legends shall be as scheduled on the drawings.

END OF SECTION

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PART 1 - GENERAL

1.1 SCOPE

- A. Work under this section includes all scheduling and administration of pre-construction and progress meetings as herein specified and necessary for the proper and complete performance of this work.
- B. Scheduling and Administration by Engineer/Owner:
 - 1. Prepare agenda.
 - 2. Make physical arrangements for the meetings.
 - 3. Preside at meetings.
 - 4. Record minutes and include significant proceedings and decisions.
 - 5. Distribute copies of the minutes to participants.

1.2 PRE-CONSTRUCTION CONFERENCE

- A. The Engineer shall schedule the pre-construction conference prior to the issuance of the Notice to Proceed.
- B. Representatives of the following parties are to be in attendance at the meeting;
 - 1. Owner
 - 2. Engineer
 - 3. Contractor and superintendent
 - 4. Major subcontractors
 - 5. Representatives of governmental or regulatory agencies when appropriate
- C. The agenda for the pre-construction conference shall consist of the following as a minimum:
 - 1. Distribute and discuss a list of major subcontractors and a tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel and emergency telephone numbers.
 - 4. Processing of field decisions and change orders.
 - 5. Adequacy of distribution of contract documents.

6. Schedule and submittal of shop drawings, product data and samples.
7. Pay request format, submittal cutoff date, pay date and retainage.
8. Procedures for maintaining record documents.
9. Use of premises, including office and storage areas and owner's requirements.
10. Major equipment deliveries and priorities.
11. Safety and first aid procedures.
12. Security procedures.
13. Housekeeping procedures.
14. Work hours.

1.3 PROJECT COORDINATION MEETINGS

- A. Schedule regular monthly meetings as directed by the Engineer.
- B. Hold called meetings as the progress of the work dictates.
- C. The meetings shall be held at the location indicated by the Engineer.
- D. Representatives of the following parties are to be in attendance at the meetings:
 1. Engineer
 2. Contractor and superintendent
 3. Major subcontractors as pertinent to the agenda
 4. Owner's representative as appropriate
 5. Representatives of governmental or other regulatory agencies as appropriate
- E. The minimum agenda for progress meetings shall consist of the following.
 1. Review and approve minutes of previous meetings.
 2. Review work progress since last meeting.
 3. Note field observations, problems and decisions.
 4. Identify problems which impede planned progress.
 5. Review off-site fabrication problems.

6. Review Contractor's corrective measures and procedures to regain planned schedule.
7. Review Contractor's revision to the construction schedule.
8. Review submittal schedule; expedite as required to maintain schedule.
9. Maintenance of quality and work standards.
10. Review changes proposed by Owner for their effect on the construction schedule and completion date.
11. Complete other current business.

END OF SECTION

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PART 1 - GENERAL**1.1 SCOPE**

- A. The work under this section includes submittal to the Engineer of shop drawings, product data and samples required by the various sections of these specifications.
- B. Submittal Contents: The submittal contents required are specified in each section.
- C. Definitions: Submittals are categorized as follows:
 - 1. Shop Drawings
 - a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instruction, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.
 - b. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The contract drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note which are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawing copies without appropriate final "Action" markings by the Engineer to be used in connection with the work.
 - c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, specification section, schedule or room numbers shown on the Contract Drawings.
 - d. Minimum assembly drawings sheet size shall be 24 x 36-inches.
 - e. Minimum detail sheet size shall be 8-1/2 x 11-inches.
 - f. Minimum Scale:
 - 1) Assembly Drawings Sheet, Scale: 1 – inch = 30 feet.
 - 2) Detail Sheet, Scale: 1/4 - inch = 1 foot.
 - 2. Product Data
 - a. Product data include standard printed information on materials, products and systems not specially prepared for this project, other than the designation of selections from among available choices printed therein.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- b. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options are applicable to the project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.
3. Samples
 - a. Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
 - b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by the Engineer. Engineer will note "test" samples, except as otherwise indicated for other requirements, which are the exclusive responsibility of the Contractor.
 4. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work but not processed as shop drawings, product data or samples.

1.2 SPECIFIC CATEGORY REQUIREMENTS

- A. General: Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal.
 1. Submittals shall contain:
 - a. Three (3) sets of shop drawings, manufacturer's literature, etc. to be retained by the Engineer, plus the number of copies required by the Contractor, Manufacturer, etc.
 - b. The date of submittal and the dates of any previous submittals
 - c. The project title.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- d. Numerical submittal numbers, starting with 1.0, 2.0, etc. Revisions to be numbered 1.1, 1.2, etc.
- e. The names of:
 - 1) Contractor
 - 2) Supplier
 - 3) Manufacturer
- f. Identification of the product, with the specification section number, permanent equipment tag numbers and applicable drawing number.
- g. Field dimensions, clearly identified as such.
- h. Relation to adjacent or critical features of the work or materials.
- i. Applicable standards, such as ASTM or federal specification numbers.
- j. Notification to the Engineer in writing, at time of submissions, of any deviations on the submittals from requirements of the contract documents.
- k. Identification of revisions on re-submittals.
- l. An 8 x 3-inch blank space for Contractor and Engineer stamps.
- m. Contractor's stamp, initialed or signed, certifying the review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the work and of contract documents.
- n. Submittal sheets or drawings showing more than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out.

1.3 ROUTING OF SUBMITTALS

- A. Submittals and routing correspondence shall be routed as follows:
 - 1. Supplier to Contractor (through representative if applicable).
 - 2. Contractor to Engineer
 - 3. Engineer to Contractor and Owner
 - 4. Contractor to Supplier

1.4 ADDRESS FOR COMMUNICATIONS

Engineer: KCI Technologies Inc.
106 Clair Drive
Piedmont, SC 29673
(864) 269-0890

PART 2 - PRODUCTS**2.1 SHOP DRAWINGS**

- A. Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.
- B. Submit all shop assembly drawings larger than 11 x 17-inches in the form of one reproducible transparency with two opaque prints or blue lines.
- C. Submit all shop drawings 11 x 17 inches and smaller in the form of six opaque prints or blue lines.
- D. One reproducible for all submittals larger than 11 x 17- inches and no more than three prints of other submittals will be returned to the Contractor.

2.2 MANUFACTURER'S LITERATURE

- A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Engineer's review.
- B. Submit the number of copies which are required to be returned (not to exceed three) plus three copies which will be retained by the Engineer.

2.3 SAMPLES

- A. Samples shall illustrate materials, equipment or workmanship and established standards by which completed work is judged.
- B. Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article proposed to be furnished.
- C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Engineer.

2.4 COLORS

- A. Unless the precise color and pattern is specifically described in the contract documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.

- B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

2.5 OPERATION, MAINTENANCE AND SERVICE MANUALS

- A. Prepare and submit for the Owner's use two (2) copies of O&M Manual for each piece of equipment.
 - 1. Submit Manuals 60 days prior to delivery of equipment.
- B. Manuals shall be specific to the equipment supplied.
 - 1. Manuals applicable to many different configurations and which require the operator to selectively read portions of the instructions will not be accepted.
 - 2. The equipment model that the Manual applies to shall be indicated by an arrow.
- C. Provide a Table of Contents specific to each Manual.
- D. At the beginning of each Manual, provide a description of the equipment to include model numbers, purchase order numbers, serial numbers, motor information, and performance and design criteria.
- E. Correlate Manuals with the approved shop drawings and include the following minimum information:
 - 1. Parts list, including recommended spare parts list.
 - 2. Guarantees.
 - 3. Recommended maintenance instructions.
 - 4. Recommended lubricants and lubrication instructions.
 - 5. Address and telephone number of the source for repairs, spare parts and service.
 - 6. Detailed description of operating procedure for the item of equipment specifically written for this installation, including start-up and shut-down procedures.
 - 7. Equipment performance specifications, including pump curves.
 - 8. Results of start-up and any further recommendations resulting from start-up.
 - 9. Current cost for each recommended spare part and agreement to provide updated costs at Owner's request.
- F. Provide a maintenance and lubrication schedule to be a summary of all preventative maintenance and lubrication, including the following information:

1. Title.
 2. Type of activity (inspection, adjustment, oil change, etc.).
 3. Brief description of activity.
 4. Type of lubricant.
 5. Frequency (daily, weekly, etc.).
- G. The manufacturer shall provide the Owner with a log chart to record all servicing and maintenance required during the equipment warranty period.
- H. For process oriented equipment, treatment plants, etc., provide a detailed description of the process operation and trouble-shooting of problems.
- I. Provide clear and legible copies. Type parts lists, etc.
- J. Layout and detail drawings shall be reduced to a maximum size of 11" x 17", unless written approval is received from the Engineer prior to submittal of Manuals.
- K. Provide a clearly labeled three-ring binder for Manuals having a thickness greater than 1/2". Provide sheet lifters if binder is more than 1/2 full.
1. Provide multiple binders for Manuals having a thickness greater than 2".

PART 3 - EXECUTION

3.1 CONTRACTOR'S COORDINATION OF SUBMITTALS

- A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:
1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
 2. Coordinate as required with all trades and all public agencies involved.
 3. Submit a written statement of review and compliance with the requirements of all applicable technical Specifications as well as the requirements of this section.
 4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the contract documents.
- B. Each and every copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawing submittal to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- C. The Owner may back charge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a “No Exceptions Taken” mark.
- D. Grouping of Submittals
 - 1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items.
 - 2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor’s responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them, and then make one submittal to the Engineer along with Contractor’s comments as to compliance, non-compliance or features requiring special attention.
- E. Schedule of Submittals: Within 30 days of contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor’s responsibility and some time allowance for re-submittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.2 TIMING OF SUBMITTALS

- A. Engineer Review
 - 1. Allow a minimum of 30 days for the Engineer’s initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the Work, and therefore the work would be expedited if processing time could be foreshortened.
 - 2. Acceptable submittals will be marked “No Exceptions Taken”. A minimum of three (3) copies will be retained by the Engineer for Engineer’s and the Owner’s use and the remaining copies will be returned to the Contractor.
 - 3. Submittals requiring minor corrections before the product is acceptable will be marked “Make Corrections Noted”. The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked “No Exceptions Taken” prior to installation or use of products.
 - 4. Submittals marked “Revise and Resubmit” must be revised to reflect required changes and the initial review procedure repeated.

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

5. The “Rejected” notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.
 6. Only two copies of items marked “Revise and Resubmit” and “Rejected” will be reviewed and marked. One copy will be retained by the Engineer and the other copy with all remaining unmarked copies will be returned to the Contractor for re-submittal.
- B. No work or products shall be installed without a drawing or submittal bearing the “No Exceptions Taken” notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer’s stamp.
- C. Substitutions: In the event the Contractor obtains the Engineer’s approval for the use of products other than those which are listed first in the contract documents, the Contractor shall, at the Contractor’s own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.
- D. Use of the “No Exceptions Taken” notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the contract documents. The Engineer’s review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the project and compliance with the information given in the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.3 RESUBMISSION REQUIREMENTS

- A. Shop Drawings
1. Revise initial drawings as required and resubmit as specified for initial submittal, with the re-submittal number shown.
 2. Indicate on drawings all changes which have been made other than those requested by the Engineer.
- B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with re-submittal number shown.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

- A. This section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the project meet the requirements of these specifications.
- B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these specifications, i.e., concrete strength and slump testing, soil compaction, etc.
- C. This work does not include materials testing required in various sections of these specifications to be performed by the manufacturer, e.g., testing of pipe.
- D. The testing laboratory or laboratories will be selected by the Owner and will work for the Owner.

1.2 PAYMENT FOR TESTING SERVICES

- A. The cost of testing services required by the contract shall be paid for by the Owner; i.e., concrete testing, soil compaction, and asphalt testing, etc.
- B. The cost of additional testing services not specifically required in the specifications, but requested by the Owner or Engineer, shall be paid for by the Owner.
- C. The cost of material testing described in various sections of these specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.
- D. The cost of retesting any item that fails to meet the requirements of these specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.3 LABORATORY DUTIES

- A. Cooperate with the Owner, Engineer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.
 - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 - 2. Ascertain compliance with requirements of the contract documents.
- D. Promptly notify the Engineer and Contractor of irregularity or deficiency of work which are observed during performance of services.

- E. Promptly submit three copies (two copies to the Engineer and one copy to the Contractor) of report of inspections and tests in addition to those additional copies required by the Contractor with the following information included:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing Laboratory name and address
 - 4. Name and signature of inspector
 - 5. Date of inspection or sampling
 - 6. Record of temperature and weather
 - 7. Date of test
 - 8. Identification of product and Specification section
 - 9. Location of Project
 - 10. Type of inspection or test
 - 11. Results of test
 - 12. Observation regarding compliance with the contract documents
- F. Perform additional services as required.
- G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the contract documents, or approve or accept any portion of the work.

1.4 CONTRACTOR RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to work and/or manufacturer's requirements.
- B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.
- D. Furnish required labor and facilities to:
 - 1. Obtain and handle samples at the site;
 - 2. Facilitate inspections and tests;

3. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.
- E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.
- G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.5 QUALITY ASSURANCE

Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.6 PRODUCT HANDLING

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the work.

1.7 FURNISHING MATERIALS

The Contractor shall be responsible for furnishing all materials necessary for testing.

1.8 CODE COMPLIANCE TESTING

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the contract documents.

1.9 CONTRACTOR'S CONVENIENCE TESTING

Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor and at the Contractor's expense.

1.10 TESTING SCHEDULE

- A. Establishing Schedule
 1. The Contractor shall, by advance discussion with the testing laboratory, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.
 2. Provide all required time within the construction schedule.

- B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.
- C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner.

1.11 SAMPLING SPECIMENS

Unless otherwise indicated in the contract documents, all specimens and samples for tests will be sampled by the testing laboratory or the Engineer.

1.12 TRANSPORTING SAMPLES

The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

END OF SECTION

PART 1 – GENERAL**1.1 SECTION INCLUDES**

- A. Temporary utilities.
- B. Temporary telephone service.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Staging and storage areas.
- F. Security requirements.
- G. Vehicular access and parking.
- H. Waste removal facilities and services.
- I. Field offices.
- J. Protection of installed work.

1.2 TEMPORARY UTILITIES

- A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- B. No cost or usage charges for temporary services or facilities are chargeable to the Owner or Owner's Representative. Cost or use charges for temporary services or facilities, or for operation of permanent utilities prior to substantial completion, will not be accepted as a basis of claims for an increase in the contract sum.

1.3 INTERNET SERVICE

- A. Provide, maintain, and pay for internet service to field office and Owner's Representative's field office at time of project mobilization.

1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Provide sanitary facilities for the Owner / Contractor Field Office and the Contractors Field Office and work force personnel.
- C. New permanent facilities may not be used during construction operations.

TEMPORARY FACILITIES AND CONTROLS

- D. Maintain daily in clean and sanitary condition.
- E. At end of construction, return facilities to same or better condition as originally found.

1.5 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

1.6 TEMPORARY FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high temporary security fence for the construction site to provide unauthorized access; equip with vehicular gate and locks.

1.7 STAGING AND STORAGE AREA(S)

- A. Locate staging and storage area(s) as indicated.
- B. Provide approved construction fencing for protection of the public.

1.8 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.9 VEHICULAR ACCESS AND PARKING

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Existing on-site roads may be used for construction traffic.
- E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- F. Designate two parking spaces for Owner and Owner's Representative use.

1.10 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site weekly.

TEMPORARY FACILITIES AND CONTROLS

- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.11 FIELD OFFICES

- A. Provide an Owner / Engineer Field Office as described in Part 2 below.
- B. Permanent facilities shall not be used for field offices.

PART 2 – PRODUCTS**2.1 MATERIALS, EQUIPMENT, FURNISHINGS**

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.2 CONSTRUCTION

- A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
- B. Lighting for Offices: 80 fc (861 lx) at desk top height, exterior lighting at entrance doors.
- C. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.3 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs.
- B. Other Furnishings: Contractor's option.
- C. Equipment: Six adjustable band protective helmets for visitors, one 10 inch (250 mm) outdoor weather thermometer and rain gauge.

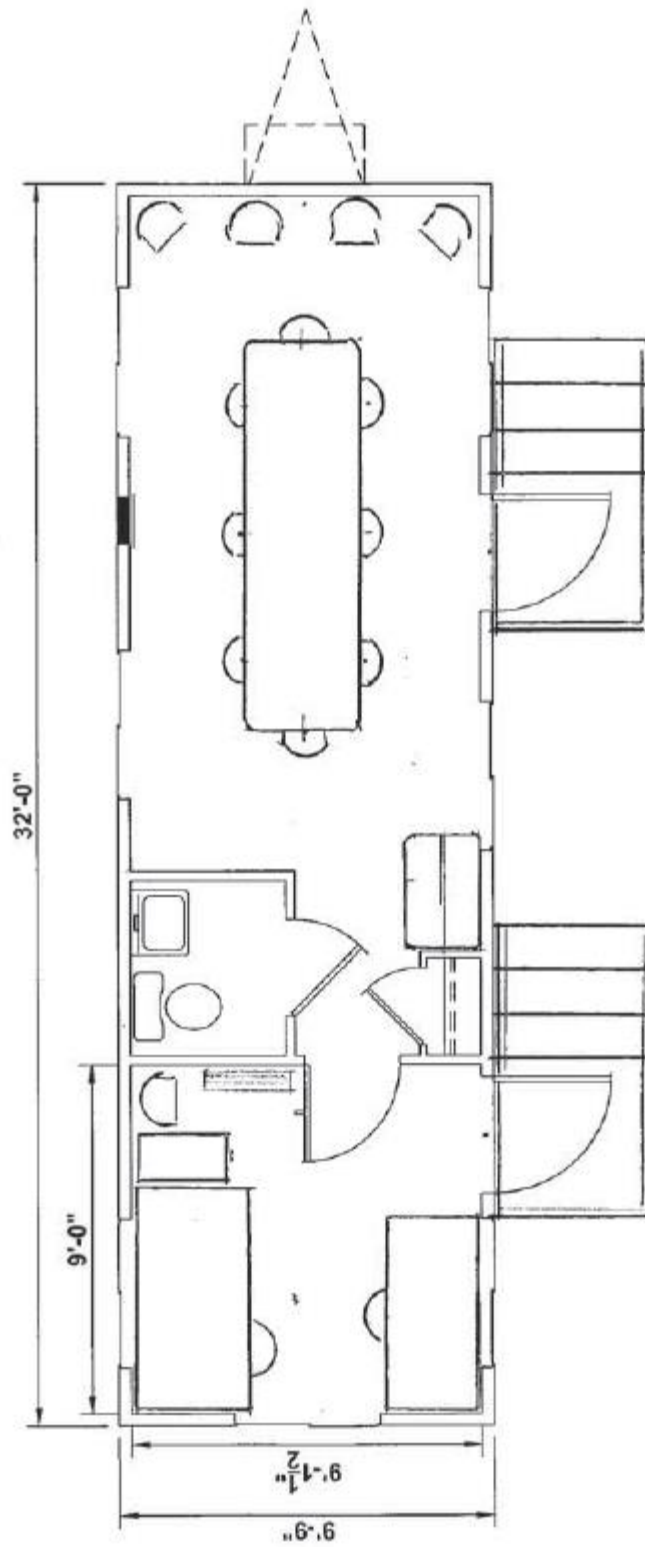
2.4 OWNER AND ARCHITECT/ENGINEER OFFICE

- A. Provide a temporary construction field office for the sole use of Owner and Owner's Representative.
- B. Size and configuration shall be as indicated on Attachment 01500-A included in this section.
- C. Windows: Minimum three minimum total area of 10 percent of floor area, with operable sash and insect screens. Locate to provide views of construction area.
- D. Electrical Distribution Panel: Two circuits minimum, 110 volt, 60 hz service.
- E. Minimum four 110 volt duplex convenience outlets, one on each wall.

TEMPORARY FACILITIES AND CONTROLS

- F. Provide heating and cooling units for the entire office space.
- G. Internet Service: As specified in Section 01500-1.3.
- H. Sanitary Facilities: As specified in Section 01500-1.4.
- I. The Owner / Engineer Field Office shall be furnished with the following.
 - 10 ft long conference table
 - 13 each visitors chairs
 - Desk with swivel chair
 - Drawing table with swivel chair
 - Hanging plan rack
 - One each two drawer file cabinet
 - Outdoor thermometer and rain gauge
 - Two each wastebaskets and a supply of trash bags for the duration of the project.
 - Small refrigerator
 - Microwave
 - Coffee Maker
 - Five each visitor hard hats and safety vests

PART 3 EXECUTION - NOT USED



Attachment 01500-A

END OF SECTION

PART 1 - GENERAL

1.1 BARRICADES, LIGHTS AND SIGNALS

- A. The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction.

- B. The Contractor will be held responsible for all damage to the work due to failure of barricades, signs and lights. Whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at Contractor's cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the project has been accepted by the Owner.

END OF SECTION

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PART 1 - GENERAL

1.1 SCOPE

Limit blowing dust caused by construction operations by applying water or employing other appropriate means or methods to maintain dust control, subject to the approval of the Owner. At a minimum, this may require the use of a water wagon twice a day to suppress dusty conditions.

1.2 PROTECTION OF ADJACENT PROPERTY

- A. The bidders shall visit the site and note the buildings, landscaping, roads, parking areas, environmentally sensitive areas and other facilities near the work site that may be damaged by their operations. The Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from Contractor's operations.

- B. Protect all existing facilities (indoors or out) from damage by dust, fumes, spray or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation and building or other surfaces from dirt, dust, welding fumes, paint spray, spills or droppings causing wear, corrosion, malfunction, failure or defacement by enclosure, sprinkling or other dust palliatives, masking and covering, exhausting or containment.

END OF SECTION

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PART 1 - GENERAL**1.1 SCOPE**

- A. The Contractor shall provide transportation of all equipment, materials and products furnished under these contract documents to the work site. In addition, the Contractor shall provide preparation for shipment, loading, unloading, handling and preparation for installation and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the work.
- B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the work.

1.2 TRANSPORTATION

- A. All equipment shall be suitably boxed, crated or otherwise protected during transportation.
- B. Where equipment will be installed using existing cranes or hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment.
- C. Small items and appurtenances such as gauges, valves, switches, instruments and probes which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.3 HANDLING

- A. All equipment, materials and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.
- D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

1.4 OWNER FURNISHED EQUIPMENT

- A. Owner furnished equipment, if any, shall mean any Owner equipment purchased and required by these specifications to be installed by the Contractor.
- B. The Owner shall be responsible for transportation to the site of all Owner furnished equipment.
- C. The Contractor shall off-load and store all Owner furnished equipment per this section of these specifications.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

The work under this section includes, but is not necessarily limited to, the furnishing of all labor, tools and materials necessary to properly store and protect all materials, equipment, products and the like, as necessary for the proper and complete performance of the work.

1.2 STORAGE AND PROTECTION

A. Storage

1. Maintain ample way for foot traffic at all times, except as otherwise approved by the Engineer.
2. All property damaged by reason of storing of material shall be properly replaced at no additional cost to the Owner.
3. Packaged materials shall be delivered in original unopened containers and so stored until ready for use.
4. All materials shall meet the requirements of these specifications at the time that they are used in the work.
5. Store products in accordance with manufacturer's instructions.

B. Protection

1. Use all means necessary to protect the materials, equipment and products of every section before, during and after installation and to protect the installed work and materials of all other trades.
2. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage, vandalism or other causes.
3. Substantially constructed weather tight storage sheds, with raised floors, shall be provided and maintained as may be required to adequately protect those materials and products stored on the Site which may require protection from damage by the elements.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Engineer and at no additional cost to the Owner.

D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel and sheet construction products shall be stored with one end elevated to facilitate drainage.

- E. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, gypsum board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block and structural tile may be stored outdoors under a properly secured waterproof covering.
- F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3 EXTENDED STORAGE

In the event that certain items of major equipment such as air compressors, pumps and mechanical aerators have to be stored for an extended period of time, the Contractor shall provide satisfactory long-term storage facilities which are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coatings, power, nitrogen purge, desiccants, lubricants and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

1.4 OWNER FURNISHED EQUIPMENT

The Contractor shall provide storage and protection for all Owner furnished equipment and materials, including extended storage as specified above.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
 - 2. Additional procedures also may be prescribed in other Sections of these specifications.

1.2 QUALITY ASSURANCE

- A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

- A. Except as otherwise approved by the Engineer, determine and comply with manufacturer's recommendations on product handling, storage and protection.

1.4 PACKAGING

- A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
 - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
 - 2. Promptly remove damaged material and unsuitable items from the job site and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- B. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality and other pertinent information.

1.5 PROTECTION OF MATERIAL AND WORK

- A. General:
 - 1. Carefully and properly protect all materials of every description, both before and after being used in the Work in accordance with manufacturer's recommendations.

2. Provide any enclosing or special protection from weather deemed necessary by the Engineer at no additional cost to the Owner.
- B. Partial payments under the Contract will not relieve the Contractor from responsibility.
1. When materials and work at the site which have been partially paid for are not adequately protected by the Contractor, such materials will be protected by the Owner at the expense of the Contractor and no further partial payment thereon will be made.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

1.6 STORAGE

- A. Store all items of equipment, component parts, etc., in accordance with the manufacturers' recommendations or as may otherwise be necessary to prevent damage or deterioration of any sort.
- B. Electrical and control equipment:
1. Store in a dry area protected from dust and humidity.
 2. Equipment can be protected by a weatherproof cover if shipped to the site no more than two (2) weeks prior to installation and energization.

1.7 REPAIRS AND REPLACEMENTS

- A. In the event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the contract time of completion.

PART 2 - MATERIALS

Not used

PART 3 - EXECUTION

Not Used

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included shall be providing compliance with the requirements of the Standard General Conditions (00700) and Supplementary Conditions (00800) of these Specifications for administrative procedures in closing out the project work.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Other requirements for technical services are stated in other sections of these Specifications.

1.2 SUBSTANTIAL COMPLETION

- A. The Contractor shall notify the Engineer that, in his opinion, the project is substantially complete. A written statement listing items complete shall be submitted.
- B. Upon receipt of the Contractor's notice, the Engineer shall make an observation to determine if substantial completion is provided.
- C. If, in the Engineer's opinion, the project is not substantially complete, a written notice to the Contractor shall follow outlining reasons and deficiencies in work which comprised his decision. The Engineer's decision shall be final.
- D. Generally, substantial completion shall be defined as units or facilities properly functioning as designed.

1.3 FINAL OBSERVATION

- A. The Engineer will make a final observation for the Contractor after any and all items noted in the substantial completion observation have been corrected. The Contractor shall notify the Engineer in writing when a final observation is needed. Incomplete and/or defective work shall be given to the Contractor by written notice.

1.4 REOBSERVATION

- A. Re-observation required due to failure by the Contractor to make previously noted corrections will be performed by the Engineer. Cost for such observations will be due to and payable by the Contractor at a rate equal to charges to the Owner for similar work.
- B. Re-observations will continue until the work is acceptable to the Engineer.

1.5 COMPLETION BY CONTRACTOR

- A. When the Engineer finds the Contractor's work acceptable, the Contractor shall be given such notice and should proceed with closeout submittals.

- B. Closeout submittals shall contain at least the following:
1. Project record documents.
 2. Equipment operation and maintenance manuals and copies of start-up reports.
 3. Warranties and bonds.
 4. Spare parts and manuals.
 5. Evidence of payment and release to liens per General Conditions.

1.6 FINAL PAYMENT

- A. Final payment to the Contractor will be made upon completion of the previous items and others required by these specifications. A final statement shall be forwarded to the Engineer. The statement shall address:
1. Previous change orders.
 2. Unit prices.
 3. Deductions for uncorrected work.
 4. Deductions for liquidated damages.
 5. Deductions for re-testing work.
 6. Deductions for re-observation.
 7. Deductions for shop drawing review.
 8. Adjusted contract sum.
 9. Previous payments.
 10. Amount due.
- B. When required, the Engineer will prepare a contract change order for adjustments not previously made.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE

This section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the project unless otherwise shown on the drawings or specified elsewhere in these specifications.

1.2 QUALITY ASSURANCE

- A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.
- B. In addition to the standards described in this section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.3 HAZARD CONTROL

- A. The Contractor shall store volatile wastes in covered metal containers and remove from premises daily.
- B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.
- C. Burning or burying rubbish and waste materials on the site shall not be allowed.
- D. Disposal of volatile wastes into sanitary storm sewers shall not be allowed.

1.4 DISPOSAL OF SURPLUS MATERIALS

- A. Unless otherwise shown on the drawings, specified or directed, the Contractor shall legally dispose, off the site, all surplus excavated materials and materials and equipment from demolition and shall provide Contractor's own suitable, off-site spoil area, or utilize a site designated by the Owner.
- B. The Owner shall have the opportunity to inspect any removed equipment or materials prior to disposal by the Contractor. If said equipment and/or materials are determined to be salvageable by the Owner, the Contractor shall transport said equipment and material to a building or area designated by the Owner.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General

1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this work.
3. At least each week, and more often as necessary, completely remove all scrap, debris and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site; restack or otherwise service all arrangements to meet the requirements of paragraph 3.1 above.
3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

3.2 FINAL CLEANING

- A. **Definitions:** Except as otherwise specifically provided, “clean” for the purpose of this Section shall be interpreted as meaning the level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.
- B. **General:** Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final cleaning as described in 3.1 above.
- C. **Site:** Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.
- D. **Restoration of Landscape Damage:** Any landscape feature scarred or damaged by the Contractor’s equipment or operations shall be restored as nearly as possible to its original condition at the Contractor’s expense. The Engineer will decide what method of restoration shall be used.

- E. The Contractor shall protect all trees outside of the limits of construction. The Contractor shall be responsible for the replacement of damaged trees outside the limits of construction.
- F. Post-Construction Clean-up or Obliteration: The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction, as directed by the Engineer.
- G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept a completely clean project.

3.3 CLEANING DURING OWNER'S OCCUPANCY

Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Engineer in accordance with the supplementary conditions of the contract documents.

END OF SECTION

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PART 1 - GENERAL

1.1 SCOPE

- A. The work under this section includes, but is not necessarily limited to, the compiling, maintaining, recording and submitting of project record documents as herein specified.
- B. Record documents include, but are not limited to:
 - 1. Drawings
 - 2. Specifications
 - 3. Change Orders and other modifications to the Contract
 - 4. Engineer field orders or written instructions, including requests for information (RFI) and clarification memorandums
 - 5. Reviewed shop drawings, product data and samples
 - 6. Test records
- C. The Contractor shall maintain on the project site throughout the contract time an up to date set of record drawings.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Storage
 - 1. Store documents and samples in the Contractor's field office, apart from documents used for construction.
 - 2. Provide files and racks for storage of documents.
 - 3. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with format of these Specifications.
- C. Maintenance
 - 1. Maintain documents in a clean, dry, legible condition and in good order.
 - 2. Do not use record documents for construction purposes.
 - 3. Maintain at the site for the Owner one copy of all record documents.
- D. Make documents and samples available at all times for inspection by Engineer.
- E. Failure to maintain the record documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.3 QUALITY ASSURANCE

- A. Unless noted otherwise, record drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.
- B. Unless noted otherwise, record drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.
- C. The Contractor shall employ a currently registered surveyor to prepare the record drawings from a post-construction, field run survey. The record drawings shall provide elevations to the nearest 0.01 foot for all manhole inverts, manhole frames and other pertinent items constructed by the Contractor. The record drawings shall provide dimensions, distances, and coordinates to the nearest 0.01 foot and horizontal angles to the nearest 10 seconds.

1.4 RECORDING

- A. Label each document “project record” in neat, large printed letters.
- B. Recording
 - 1. Record information concurrently with construction progress.
 - 2. Do not conceal any work until required information is recorded.

1.5 RECORD DRAWINGS

- A. Contractor shall provide two sets of neat, clean, legible redline drawings to the Owner.
- B. Legibly mark and revise drawings to record actual construction, including:
 - 1. All Construction
 - a. Changes of dimension and detail.
 - b. Changes made by requests for information (RFI), field order, clarification memorandums or by change order.
 - c. Details not on original drawings.
 - d. Two sets of approved shop drawings.
 - 2. Site Improvements, Including Underground Utilities
 - a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced to permanent surface improvements.
 - b. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.

- c. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.
 - d. All sewer mains (type, size) and appurtenances such as manholes, laterals, cleanouts, pump stations, etc. shall be located and tied into the state plane coordinates. Also show the distance between manholes, invert and rim elevations, angles and sewer profiles.
3. Structures
- a. Depths of various elements of foundation in relation to finish first floor datum or top of wall.
 - b. Location of internal and buried utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

1.6 SPECIFICATIONS

- A. Legibly mark each section to record:
- 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by requests for information (RFI), field order, clarification memorandums, or by change order.

1.7 SUBMITTAL

- A. At contract closeout, deliver record documents to the Owner.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
- 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each record document
 - 5. Signature of Contractor or Contractor's authorized representative

END OF SECTION

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PART 1 - GENERAL

1.1 PROJECT MAINTENANCE AND WARRANTY

- A. Maintain and keep in good repair the work covered by these drawings and specifications until acceptance by the Owner.
- B. The Contractor shall warrant for a period of one year from the date of Owner's written acceptance of certain segments of the work and/or Owner's written final acceptance of the project, as defined in the contract documents, that the completed work is free from all defects due to faulty products or workmanship. The Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the Cost thereby incurred. The performance bond shall remain in full force and effect throughout the warranty period.
- C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.
- D. In the event of multiple failures of major consequence prior to the expiration of the one year warranty described above, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new 12-month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken housing, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published maintenance instructions, shall be exempted from the scope of the one year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified or replaced as necessary and re-warranted for one year.
- E. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.

- F. Except as noted on the drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.
- G. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the Owner of the road to make such repairs, the Contractor shall reimburse the Owner of the road for the cost of such repairs.
- H. The Contractor shall protect existing trees and other vegetation to remain in place against unnecessary cutting, breaking, skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line and excess foot or vehicular traffic, or parking of vehicles within drip line. The Contractor shall be responsible for the replacement of such damaged trees and vegetation.
- I. In the event the Contractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the Work to be done, as described in the drawings and specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.
- J. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.
- K. Neither the foregoing paragraphs nor any provision in the contract documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

END OF SECTION

DIVISION 2
SITE CONSTRUCTION

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PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included: Demolish and remove from the site those items so indicated on the drawings, including concrete structures, equipment pads, parking and roadway areas, miscellaneous structures, poles, equipment, walls, utilities, signs, etc.
- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Comply with the Standard Building Code with due regard to the protection of the public and the provision of safeguards during the performance of the work.
- C. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
- D. Comply with requirements of governmental agencies having jurisdiction.
- E. Contractor is responsible for being aware of and complying with the Asbestos NESHAP regulations, as well as other applicable codes, laws, and regulations.
 - 1. The Owner is to be notified immediately upon discovery of asbestos materials.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the safe, timely, and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 DEMOLITION

- A. General
 - 1. Prior to start of demolition, carefully study the drawings and these specifications.
 - 2. In company with the owner's representative, visit the site and verify the extent of demolition to be performed under this contract.
- B. Using only the means and equipment approved for this purpose by the government agencies having jurisdiction, demolish and completely remove from the job site the existing construction designated to be removed.
 - 1. Shut off, cap, reroute, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
 - 2. Remove rocks larger than 2" diameter, roots, wood, and debris.
- C. Demolished material shall be considered to be property of the contractor and shall be completely removed from the job site.
- D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Use appropriate means necessary to protect the public safety during the demolition process.
- F. Use appropriate means necessary to protect the adjacent structures from damage during demolition.
- G. Erosion Control: Construct and maintain erosion control as shown on the drawings and in accordance with the local county's requirements.

3.3 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Remove trees, underbrush, undesirable growth, stumps, roots, etc., from the area to the limits shown on the drawings, as specified herein, and as needed to meet the requirements of the construction shown in the contract documents.
- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.
 - 2. Section 02260: Erosion and Sediment Control.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner.
- C. Comply with requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 AREA INCLUDED

- A. Construction zone as indicated on drawings. The Contractor shall not encroach on areas outside the construction zones identified in the drawings.

3.2 PROTECTION

- A. The Contractor shall protect all areas outside the designated construction zones. These areas shall not be used for site access, vehicle parking, or stockpiling of soil or construction materials.
- B. The Contractor shall protect any trees within the designated construction zones that have been marked by the landowner for preservation. The contractor shall not park vehicles or stockpile soil or construction materials within the drip line of these trees. If the sewer line is to pass within the drip line of a marked tree, the Contractor shall take reasonable precautions to prevent excessive damage to the roots and trunk of the tree.

- C. The Contractor shall protect trees outside the construction zone whose drip line extends into the construction zone. The Contractor shall not park vehicles or stockpile soil or construction materials within the drip line of these trees.

3.3 PROCEDURES

- A. **Site Walkthrough:** Following the layout of the construction work (including manhole locations and limits of construction) and prior to beginning clearing and grubbing, the Contractor, Engineer, and Owner shall walk through the site to identify potential conflicts with easement special conditions or other project requirements. The Contractor shall not proceed with clearing and grubbing until any identified conflicts have been addressed in writing.
- B. **Clearing and Grubbing:** Except as otherwise noted in this Specification, the entire area within the limit lines described above shall be cleared and grubbed. Remove all vegetation, trees, brush, stumps, etc., from the area. All debris from this operation shall be burned if allowed by local regulations or shall otherwise be disposed of off the owner's property.
- C. **Selective clearing** shall be done in areas designated by the engineer. Selective clearing shall consist of removing vegetation, brush, stumps, etc., from the area. Selected trees shall be left standing and care shall be taken not to damage trees to be left. All debris from this operation shall be burned if allowed by local regulations or shall otherwise be disposed of off the owner's property. Grubbing will not be required in areas designated for selective clearing.
- D. **Removal of trees and shrubs:** All trees to be removed shall be felled in such a manner as to avoid injury to remaining trees and to other features not proposed for removal. Trees shall be cut up and the trunks, limbs, and other debris shall be removed from the site. Undesirable shrubs and small trees shall be selectively removed as directed.
- E. **Stumps and Roots:** All stumps and roots larger than 2" in diameter shall be completely removed by grubbing except in areas of building site, parking areas and drives, they may be cut off not less than 18" below any sub-grade. The area of operation then shall be cleared of resulting debris and matted roots, weeds and other extraneous matter and such shall be hauled away from the site. Generally, all material that cannot be compacted to 90% maximum density in lawn areas and 95% of maximum density elsewhere shall be removed.
- F. **Erosion Control:** Construct and maintain erosion control as shown on the drawings and in accordance with Section 02260, Erosion and Sediment Control, and the local county's requirements.

3.4 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Trench, backfill, and compact as specified herein and as needed for installation of underground utilities associated with the work.

- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.
 - 2. Section 02260: Erosion and Sediment Control
 - 3. Section 02530: Sanitary Collection

- C. Definitions:
 - 1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
 - 2. Optimum Moisture: Percentage of water in a specific material at maximum density.
 - 3. Rock excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation. The reference trench excavating machinery for this definition is a Caterpillar CAT 330 excavator (59,750-lb maximum drawbar pull) or other equipment with equivalent drawbar pull. Any material that cannot be excavated with the reference machinery is considered rock.
 - 4. Unsuitable Material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, muck, roots, and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
 - 5. Suitable Material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.

6. Select Material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1½ inch in diameter.
7. Crushed Stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.
8. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

1.3 JOB CONDITIONS

- A. Existing Utilities:
 1. There now exists in the construction areas, waterworks, storm drainage, sanitary sewers, street paving, gas mains and other utilities.
 2. Approximate location of certain underground lines and structures are shown on the plans for information only, other underground lines or structures are not shown.
 3. Locate these and other possible unknown utility lines using electronic pipe finder, or other approved means.
 4. Locate, excavate and expose all existing underground lines in advance of trenching operations.
 5. The Contractor will be held responsible for the workmanlike repair of any damage done to any of these utilities in the execution of his work under this section.
 6. The Contractor shall familiarize himself with the existing conditions and be prepared to adequately care for and safeguard himself and the Owner from damage.
- B. Notification of Intent to Excavate:
 1. South Carolina Underground Utility Damage Prevention Act (S.C. Code Ann, 58-35-10, CT-SEQ, Supp. 1978) requires persons to ascertain the location of underground public utility property prior to excavation or demolition in certain

situations. The Act also requires such persons to give timely notice of intent to excavate or demolish prior to commencing such operations. Failure to comply could subject the violator to a civil penalty of up to one thousand dollars (\$1,000) for each violation of the Act.

2. Notification of intent to excavate may be given by calling this toll free number: 1-800-922-0983.

C. Clearing:

1. Perform all clearing necessary for installation of the complete work.
2. Clearing shall consist of removing all trees, stumps, roots, brush and debris in the rights-of-way obtained for the work.
3. All other material, including trimmings from above, shall be completely disposed of in a satisfactory manner.

D. Removing and Resetting Fences:

1. Where existing fences must be removed to permit construction of utilities:
 - a. Remove such fences and, as the work progresses, reset the fences in their original location and condition.

E. Restoration Of Disturbed Areas:

1. Restore all areas disturbed by, during or as a result of construction activities to their existing or better condition.
2. Do not interpret this as requiring replacement of trees and undergrowth in undeveloped sections of the rights-of-way.

F. Minimizing Silting and Bank Erosion During Construction:

1. During construction, protective measures shall be taken and maintained to minimize silting and bank erosion of creeks and rivers adjacent to the work being performed during construction.
2. Sack breakers are to be used on steep slopes along creek banks and fill slopes to prevent washing of ditch. Sack breakers are to be placed at the direction of the Engineer.
3. Comply with Section 02260.

G. Blasting:

1. Store all explosives in a secure manner, complying with all laws, ordinances, and regulations.
2. Contractor shall be responsible for damage caused by blasting operations.

3. Do not blast within a 50-foot radius of any cast structural concrete item until the cast item attains 90% of the design compressive strength verified by testing concrete test cylinders.

PART 2 - PRODUCTS

2.1 EXCAVATED MATERIALS

- A. Perform all excavation of every description and of whatever substances encountered to depths indicated or specified.
- B. Pile material suitable for backfilling in an orderly manner at safe distance from banks or trenches to avoid overloading and to prevent slides or cave-ins.
- C. Remove and deposit unsuitable or excess materials as directed by the Engineer.

2.2 BACKFILL MATERIALS

- A. Provide from materials excavated for installation of utility.
 1. Select soil material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in greatest dimension for backfill up to 12" above top of utility being covered.
 2. Do not permit rocks larger than 2" in greatest dimension in top 6" of backfill.
- B. For marine installations backfill material shall be #57 stone.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 PROCEDURES

- A. Existing Utilities:
 1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
 2. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.
- B. Protection of Persons and Property:
1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this section.
- C. Dewatering:
1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.
 2. Keep trenches and site construction area free from water.
- D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- E. Maintain access to adjacent areas at all times.

3.2 TRENCH EXCAVATION

- A. Remove all materials of whatever substance encountered.
- B. Comply with pertinent OSHA regulations in regards to the excavation of utilities.
- C. Rock Excavation:
1. Notify the Engineer upon encountering rock or similar material which cannot be removed or excavated by conventional earth moving or ripping equipment.
 2. Do not use explosives without written permission from the Engineer.
 3. When explosives are permitted, use only experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Store, handle and use

explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.

4. The Contractor shall be solely responsible for any damage resulting from the use of explosives.
5. The Contractor is responsible for securing all permits required in performing this work.
6. Do not use blasting adjacent to existing buildings or structures.
 - a. Remove rock at such locations using jack hammers and bull points.

D. Blasting:

1. Blasting shall be performed in accordance with all laws, regulations, and ordinances in effect at the time of blasting and required by the authority having jurisdiction thereover. Contractor shall engage the services of a qualified blasting engineer to develop blasting procedures and of an independent firm to perform pre-blast and post-blast surveys and assist in monitoring blasting operations. Contractor shall notify all affected adjacent property occupants at least 24 hours prior to any blasting. Contractor shall be responsible for all damage caused by blasting operations and shall be responsible for responding to and resolving all complaints. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench.
2. All rock which cannot be handled, crushed, processed, and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.
3. Blasting or other use of explosives for excavation adjacent to existing utilities, structures, and other facilities shall be in conformity with the requirements of the local ordinance and the authority having jurisdiction there over and shall not cause damage to any adjacent structures. Contractor shall consult with and obtain written approval for blasting procedures from the appropriate utility or agency before blasting adjacent to their utilities, structures, or other facilities. Certain utilities, including gas pipelines and fiber optics, and agencies have requirements that will not permit blasting adjacent to or within a minimum distance from their utilities or structures, including utilities and structures outside the construction easements or on the opposite side of the street, if applicable.
4. The blasting procedures shall be in conformity with the requirements of the utility, if applicable. Prior to blasting, Contractor shall submit to Owner, through Engineer, a copy of the blasting procedures sealed by the blasting engineer for record purposes.

Contractor shall be responsible for obtaining all required blasting permits from the city, county, state and federal agencies and shall provide sufficient prior notice as specified by code, ordinance or other regulation to the county engineer, county sheriff, fire districts, police departments, and all other appropriate agencies and authorities where the blasting is to be performed. A copy of the

blasting permit shall be on the site before and during the blasting operations. Contractor shall furnish to Owner a copy of all blasting permits at least 7 days prior to blasting.

E. Pre-blast Survey:

1. Contractor shall perform a pre-blast survey of all utilities, structures, and other facilities adjacent to the blast sites to determine the conditions of each utility, house, building, bridge, overpass, and other structures and facilities susceptible to damage from blasting operations. The preblast survey shall include all structures and utilities within a minimum of 500 feet radius of the area to be blasted. The survey notification to all property owners, tenants, utilities, and other agencies and the area of survey shall be in conformity with the requirements of the authority having jurisdiction thereover or as determined by Contractor's insurance company if no local ordinance applies. Contractor shall submit the pre-blast survey report for record purposes, to Owner at least 30 days prior to blasting.

F. Blast Monitoring:

1. Prior to the start of Contractor's blasting, Contractor shall measure background ground vibrations.
2. Seismographs shall be placed on the ground adjacent to structures subjected to ground shock to measure peak particle velocity components in three mutually perpendicular directions during blasting operations.
3. The peak particle velocity, defined as the maximum of the three velocity components of vibration, at any location shall not exceed values that will cause damage to the adjacent structures. Air overpressure shall be measured at adjacent structures. Air overpressure at adjacent structures shall not exceed values that will cause damage to the adjacent structures or personnel. The maximum peak particle velocity and air overpressure values that will not cause damage shall be determined by the blasting engineer retained by Contractor and shall be stated in the blasting procedures.
4. Contractor shall submit measurement records of the blast monitoring to Owner for record purposes within 24 hours after each blast.

G. Post-blast Survey:

Contractor shall perform a post-blast survey of the same utilities, structures, and other facilities surveyed in the pre-blast survey to determine the effect of the blasting operations. Contractor shall submit the post-blast survey report to Owner for record purposes within 14 days after completion of blasting.

H. Unauthorized Excavation:

1. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.
2. Backfill and compact unauthorized excavation at no expense to the Owner.

- a. In wet excavations or excavations below normal groundwater elevations: Use crushed stone or lean concrete as directed by the Engineer.
- b. In dry excavations above normal groundwater elevations: Use compacted suitable material.

3.3 BACKFILLING

A. General:

1. Backfill trenches and excavations immediately after the pipes are laid, unless other protection is directed or indicated.
2. Select and deposit backfill materials with special reference to the future safety of the pipes.
3. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified or otherwise correct to the approval of the Engineer.
4. Surplus material shall be disposed of as directed by the Engineer.
5. Original surface shall be restored to the approval of the Engineer.

B. Lower Portion of Trench (Initial Backfill):

1. Deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24" over sewers and 12" over other utility lines.
2. Take special care in backfilling and bedding operations not to damage pipe and pipe coatings.

C. Remainder of Trench (Final Backfill):

1. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or half the layered thickness, whichever is smaller, in any dimension.
2. Deposit backfill material in layers not exceeding the thickness specified, and compact each layer to the minimum density directed by the specifications found within these documents.

D. Adjacent to Buildings: Mechanically compact backfill in 6" layers within ten (10') feet of buildings.

E. Under Roads, Streets and Other Paved Areas:

1. Mechanically tamp in 6" layers using heavy duty pneumatic tampers or equal.
Tamp each layer to a density equivalent of not less than 98% of an ASTM D698 Proctor Curve. Moisture content of the fill, while it is being compacted, shall be within 3% of the standard proctor optimum moisture content.

2. Provide additional compaction by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone.
 3. Refill any settlement with crushed stone and continue such maintenance until replacement of pavement is authorized by the Engineer.
- F. Undeveloped Areas:
1. Backfill in wooded, swampy or undeveloped areas shall be as specified hereinbefore, except that tamping of the backfill above a level 2' over the top of the pipe will not be required.
 2. Mound excavated material neatly over the ditch to provide for future settlement.

3.4 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

- A. This section shall apply to all excavation.
- B. Construct all permanent work in areas free from water. Design, construct and maintain all dikes, levees, cofferdams and diversion and drainage channels as necessary to maintain the areas free from water and to protect the areas to be occupied by permanent work from water damage. Remove temporary works after they have served their purpose.
- C. The Contractor shall be responsible for the stability of all temporary and permanent slopes, grades, foundations, materials and structure during the course of the Contract. Repair and replace all slopes, grades, foundations, materials and structures damaged by water, both surface and subsurface, to the lines, grades and conditions existing prior to the damage, at no additional cost to the Owner.
- D. No additional compensation shall be paid to the contractor for dewatering activities.

PART 2 - PRODUCTS

2.1 PRODUCTS SUPPLIED BY CONTRACTOR

- A. Furnish well points, pumps, tile drains or other approved methods of the type normally used in dewatering operations. Well points shall be provided where required at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 CARE OF WATER

- A. Except where the excavated materials are designated as materials for permanent work, material from required excavation may be used for dikes, levees, cofferdams and other temporary backfill provided the material meets suitability requirements for these structures.
- B. Furnish, install, maintain and operate necessary pumping and other equipment for dewatering the various parts of the work and for maintaining the foundation and other parts free from water as required for constructing each part of the work.
- C. Install all drainage ditches, sumps and pumps to control excessive seepage on excavated slopes, to drain isolated zones with perched water tables and to drain impervious surfaces at final excavation elevation.
- D. Dewater by means which will insure dry excavations, preserve final lines and grades, and not disturb or displace adjacent soil.
- E. All pumping and drainage shall be done with no damage to property or structures and without interference with the rights of the public or owners of private property.

- F. Do not overload or obstruct existing drainage facilities.
- G. After they have served their purpose, remove all temporary protective work at a satisfactory time and in a satisfactory manner. All diversion channels and other temporary excavations in areas where the compacted fill or other structures will be constructed shall be cleaned out, backfilled and processed under the same Specifications as those governing the compacted fill.
- H. When temporary works will not adversely affect any item of permanent work or the planned usage of the Project, the Contractor may be permitted to leave such temporary works in place. In such instances, breaching of dikes, levees and cofferdams may be required.

3.2 DEWATERING

- A. By the use of well points, pumps, tile drains or other approved methods, the Contractor shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.
- B. Excavations shall be continuously dewatered to maintain a ground water level no higher than three to four feet below the lowest point in the excavation. Dewatering shall be accomplished well enough in advance of excavation to ensure that groundwater is already lowered prior to completing the final excavation to finish sub-grade.
- C. All destabilized sub-grade conditions caused by inadequate or untimely dewatering operations shall be undercut and backfilled with suitable backfill material at no additional cost to the Owner.
- D. Where the presence of fine grained subsurface materials and a high groundwater table may cause the upward flow of water into the excavation with a resulting quick or unstable condition, the Contractor shall install and operate a well point system to prevent the upward flow of water during construction. Water pumped or drained from excavations, or any sewers, drains or water courses encountered in the work, shall be disposed of in a suitable manner without injury to adjacent property, the work under construction, or to pavements, roads, drives, and water courses. No water shall be discharged to sanitary sewers. Sanitary sewage shall be pumped to sanitary sewers or shall be disposed of by an approved method.

3.3 DEWATERING TRENCH EXCAVATIONS

- A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.
- B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water from running into the excavation.
- C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavation. Where the pipe line crosses natural drainage channels, the Work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the Work will be prevented.

Provisions shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.

- D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.
- E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise cease operation.
- F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the bottom of the trench. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing, 6" to 10" in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

3.4 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide protection of the environment during the construction of this project to reduce soil erosion and siltation to the lowest reasonably achievable level. Provide protection of wetlands, stream buffers, bed and bank areas outside of work limits.

1.2 GENERAL

- A. Exercise every reasonable precaution, throughout the life of the project, to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground or roadway surfaces, or other property. Erosion control practices to be used for this project are shown on the drawings and are to conform to South Carolina Department of Health & Environmental Control regulations.
- B. Contractor shall comply with the requirements of the NPDES General Permit for Stormwater Associated with Construction Activities and the Stormwater Pollution Prevention Plan for the project.

PART 2 - PRODUCTS

2.1 CRUSHED STONE

- A. Provide 2" – 3" diameter crushed stone for project entrance and exit.
- B. Provide 9" – 12" depth crushed stone for temporary sediment barriers around inlets.

2.2 GRASSING

- A. Comply with Section 02930: Grassing.

2.3 SILT FENCE

- A. Posts:
 - 1. Only steel posts shall be used. Steel posts shall be self-fastener angle steel type, 5' in length.
- B. Provide not less than No. 9 wire staples, 1.5" long for fastening wire mesh.
- C. Woven wire shall conform to the requirements of ASTM A116, Class I zinc coating for wire. Each woven square shall measure 5.33" X 12". The top and bottom wires shall be 10 gauge. All other wires shall be 12 gauge.
- D. Wire mesh is not required with synthetic, extra strength filter fabric providing a puncture strength of 50 psi in accordance with ASTM D4833.
- E. Filter fabric shall be burlap or synthetic.

- F. If silt fencing is used more than 5 days, synthetic type shall be used.
- G. Burlap shall be 7.5 ounces weight and a minimum 32" wide.
- H. Filter fabric shall be Mirafi 100X as manufactured by Celanese Fibers Co., or Bidim C34 as manufactured by DuPont or equivalent.

2.4 EROSION CONTROL BLANKET

- A. Use erosion control blanket S150, from North American Green or approved equal.

PART 3 – EXECUTION

3.1 GENERAL

- A. Construct and maintain all erosion control measures until the substantial completion of the project.

3.2 CONSTRUCTION ENTRANCE

- A. Construct a gravel area or pad at points where vehicles enter and leave a construction site.
- B. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade and place gravel to the grade and dimensions shown on the plans.
- C. Construct drainage channels to carry water to a sediment trap or other suitable outlet.
- D. Use geotextile fabrics to improve stability of the foundation in locations subject to seepage or high water table.
- E. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site by periodic top dressing with two inches of stone.
- F. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary.
- G. Immediately remove objectionable materials spilled, washed, or tracked onto public roadways.

3.3 TEMPORARY GRASSING

- A. Provide a temporary cover for erosion control on disturbed areas that will remain unstabilized for a period of more than 14 days in accordance with Section 02930.
- B. This practice applies to cleared areas, diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles where vegetation is needed for less than 1 year.
- C. Provide grassing on slope 5% or greater within 14 days of disturbance.
 - 1. Comply with Section 02930: Grassing.

3.4 SILT FENCE

- A. Provide silt fence barrier where shown on the plans and on utility construction parallel to the disturbed trench where perpendicular sheet flow runoff occurs on disturbed areas with slopes greater than 4%.
- B. Place at the extreme limits of the area to be disturbed as shown.
- C. Construct temporary sediment barriers of filter fabric, buried at the bottom, stretched and supported by posts and install below small disturbed areas as indicated on the drawings to retain sediment by reducing the flow velocity to allow sediment deposition.
- D. Provide spacing between posts 5'0" on center, minimum.
- E. Fasten wire mesh to steel posts with wire staples.
- F. Remove sediment deposits prior to reaching one-third height of the fence.
- G. Monitor site frequently and place additional silt fencing should evidence indicate that erosion is about to occur at locations other than those shown on plan.

3.5 EROSION CONTROL BLANKET

- A. Provide on areas as shown on the plans or on all embankments with slopes equal to or steeper than 2:1.

3.6 TEMPORARY SEDIMENT TRAPS

- A. Utilize temporary sediment traps at the bottom of all disturbed slopes where runoff is parallel to the utility trench and draining into an existing ditch or stream and where slopes are 5% or greater along the trench.
- B. Provide at intervals of 75'.

3.7 MAINTENANCE

- A. Place all erosion control devices or measures prior to any land disturbing activity within the drainage area they are located.
- B. Periodically check erosion control devices and clean or otherwise remove silt build-up as necessary to maintain them in proper working order.

3.8 REMOVAL

- A. Remove temporary structures after protected areas have been stabilized.

3.9 INSPECTION

- A. Contractor shall provide inspection of erosion and sediment control measures shown on the drawings and described in this section and the Stormwater Pollution Prevention Plan for the project. Inspections shall be performed by a qualified person as described in the NPDES

EROSION AND SEDIMENT CONTROL

General Permit for Stormwater Associated with Construction Activities, GAR 100000, and in accordance with the schedule in the Stormwater Pollution Prevention Plan.

3.10 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Cut, fill, excavate, backfill, compact and grade the site as necessary to bring the roads, drives, building sites, paved areas and open areas to the lines and grades shown on the drawings.
1. The work includes, but is not necessarily limited to:
 - a. Building site preparation.
 - b. Roadway, parking area, drive, and walk subgrade preparation.
 - c. Excavations and formations of embankments.
 - d. Dressing of graded areas, shoulders, and ditches.
 - e. Construction and lining of treatment basins.
 2. Classification: Material determined by the engineer to be rock as defined herein will be classified as "Rock Excavation".
 - a. Excavation of rock not indicated on the drawings will be paid for at the unit price indicated on the bid form.
 - b. Where rock is shown on the drawings, excavation of this material shall be included in the lump sum price bid for the work and no additional payment will be made for this material.
 - c. Where actual rock excavation required and performed is less than that which is indicated on the drawings, the owner shall receive a deductive amount based on the unit price indicated on the bid form.
 - d. Quantities for additional or deductive rock excavation shall be as determined by the Engineer from field measurements.
 - e. Do not perform any additional rock excavation without prior approval of the engineer.
- B. Related Work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these specifications.
 2. Section 02221 - Trenching, Backfilling for Utilities.
 3. Section 02260 - Erosion and Sediment Control.

- C. Definitions:
1. Open areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way, and parking areas.
 2. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
 3. Optimum moisture: Percentage of water in a specific material at maximum density.
 4. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation. Any material occupying an original volume of more than 1 cubic yard which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rating not less than 56,000 pounds usable pull (Caterpillar D-8K), or the excavator listed in Section 02320.1.1.D.4 is considered Rock.
 5. Unsuitable Material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technician. In addition to organic matter (greater than 5% organic content based on loss on ignition), sod, roots and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
 6. Suitable Material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SP, SC, SM, ML, CL or as designated in these specifications.
 7. Select material: Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW or GM or as otherwise approved by the engineer as select fill. Select material shall contain no stones or rubble larger than 1" in diameter.
 8. Crushed stone (gravel): Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.
 9. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.
- D. The contractor must determine for himself the volume of material required by the site.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Comply with requirements of governmental agencies having jurisdiction.
- C. A testing laboratory retained by the owner will make such tests as are deemed advisable. The contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts of fill material and shall keep the laboratory informed of his progress. The cost of the initial tests shall be paid for by the owner. Subsequent tests required as a result of improper compaction shall be paid for by the contractor.

1.3 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01610.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Soil material used as fill, backfill, subgrade for structures or pavements, embankments, or site grading shall consist of suitable material as found available on site until such supply of on-site material is depleted.
 - 1. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2" in their greatest dimension.
 - 2. Do not permit rocks having a dimension greater than 1" in the upper 6" of fill or embankment.
- B. Should the quantity of suitable on-site material be insufficient to complete the work, suitable borrow material as approved by the engineer shall be provided by the contractor at no additional expense to the owner.
- C. Select materials may be provided from on-site if acceptable material as approved by the engineer is available on site. Otherwise approved select material shall be provided by the contractor from an off-site source.

2.2 TOPSOIL

- A. Use topsoil consisting of material removed from the top 3" to 6" of existing on-site soils.
- B. Use topsoil containing no stones, roots, or large clods of soil.
- C. Stockpile topsoil separate from other excavated material.

2.3 SPECIAL SOIL MATERIALS

- A. Provide basin liner soils consisting of fine grained soils selected from excavated area or approved borrow sites, stockpiled and then placed and compacted in areas to receive liner.
- B. Sufficient material for the liner, as selected by the engineer, shall be stockpiled, kept separate from other excavated materials and piled free of undesirable materials.

2.4 WEED KILLER

- A. Provide a dry, free-flowing, dust free chemical compound, soluble in water, capable of inhibiting growth of vegetation and approved for use on this work by governmental agencies having jurisdiction.

2.5 EQUIPMENT

- A. Use equipment adequate in size, capacity and numbers to accomplish the work in a timely manner without undue waste or damage of material.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Clearing and Grubbing: Clear and grub areas to be graded prior to commencement of the grading operations.
- B. Where so directed by the owner, protect and leave standing designated desirable trees.
- C. Complete any demolition and/or removal work as may be required prior to grading operations.
- D. Dispose of all clearing, grubbing and demolition debris and other deleterious material off the project site. Vegetation, roots, brush, rubbish, stumps, etc. may be burned on-site where permitted by local authorities and regulations and approved by the Engineer.
- E. Topsoil: Strip topsoil to a depth of 3" to 6" without contamination from the subsoil and stockpile topsoil separate from other excavated materials.
 - 1. Transport and deposit topsoil in storage piles convenient to areas that are to receive topsoil or in other locations as indicated or approved by the engineer.
 - 2. Deposit topsoil in areas that are already graded and will not be disturbed by on-going construction.

3. Dispose of unsuitable or unusable stripped material off-site or as otherwise directed by the engineer.
- F. Sampling and Preliminary Testing:
1. Prior to beginning the grading operations, the contractor shall submit to the engineer his proposed sequence of excavation operations.
 2. Based upon the sequence of excavation, samples of the fill materials will be obtained as excavation proceeds and tested for grain size permeability and moisture density relationship using the Standard Proctor Method (ASTM D698, Method A).
 3. Allow sufficient time for completion of laboratory tests before any fill operations begin, using the soils being tested.

3.3 FINISH ELEVATIONS AND LINES

- A. Construct areas outside of building or structure lines true to grades shown.
1. Where no grade is indicated, shape finish surface to drain away from buildings or structures, as approved by the engineer.
- B. Degree of finish shall be that ordinarily obtainable from blade grader, supplemented with hand raking and finishing.
- C. Finish surfaces to within 0.10' above or below the established grade or approved cross section.

3.4 GENERAL PROCEDURES

- A. Existing Utilities:
1. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the contractor prior to excavating. If damaged, repair or replace at no additional cost to the owner.
 2. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the contractor, promptly notify the engineer and take necessary steps to assure that service is not interrupted.
 3. If service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the owner.
 4. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the engineer and secure his instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the engineer.

- B. Protection of Persons and Property:
 - 1. Barricade open holes and depressions occurring as part of this work, and post warning lights on property adjacent to or with public access.
 - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this section.
- C. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
- D. Maintain access to adjacent areas at all times.
- E. Excavate and backfill in a manner and sequence that will provide proper drainage at all times

3.5 EXCAVATING (CUTS)

- A. Perform excavating of every type of material encountered within the limits of the work to the lines, grades and elevations indicated and specified herein.
- B. Suitable excavated materials:
 - 1. Use all suitable materials removed from the excavation as far as practicable in the formation of the embankments, subgrades, shoulders, building sites, and other places as directed.
 - 2. Unless otherwise indicated on the drawings or approved by the engineer, surplus suitable material shall be removed from the site and disposed of by the contractor.
- C. Unsuitable Excavated Material: Remove from the site and dispose of all unsuitable material unless otherwise approved by the engineer.
- D. Rock Excavation:
 - 1. Notify the Engineer upon encountering rock or similar material which cannot be removed or excavated by conventional earth moving or ripping equipment.
 - 2. Do not use explosives without written permission from the Engineer.
 - 3. When explosives are permitted, use only experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Store, handle and use explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.
 - 4. The Contractor shall be solely responsible for any damage resulting from the use of explosives.

5. The Contractor is responsible for securing all permits required in performing this work.
6. Do not use blasting adjacent to existing buildings or structures.
 - a. Remove rock at such locations using jack hammers and bull points.

E. Blasting:

1. Blasting shall be performed in accordance with all laws, regulations, and ordinances in effect at the time of blasting and required by the authority having jurisdiction thereover. Contractor shall engage the services of a qualified blasting engineer to develop blasting procedures and of an independent firm to perform pre-blast and post-blast surveys and assist in monitoring blasting operations. Contractor shall notify all affected adjacent property occupants at least 24 hours prior to any blasting. Contractor shall be responsible for all damage caused by blasting operations and shall be responsible for responding to and resolving all complaints. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench.
2. All rock which cannot be handled, crushed, processed, and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.
3. Blasting or other use of explosives for excavation adjacent to existing utilities, structures, and other facilities shall be in conformity with the requirements of the local ordinance and the authority having jurisdiction there over and shall not cause damage to any adjacent structures. Contractor shall consult with and obtain written approval for blasting procedures from the appropriate utility or agency before blasting adjacent to their utilities, structures, or other facilities. Certain utilities, including gas pipelines and fiber optics, and agencies have requirements that will not permit blasting adjacent to or within a minimum distance from their utilities or structures, including utilities and structures outside the construction easements or on the opposite side of the street, if applicable.
4. The blasting procedures shall be in conformity with the requirements of the utility, if applicable. Prior to blasting, Contractor shall submit to Owner, through Engineer, a copy of the blasting procedures sealed by the blasting engineer for record purposes.

Contractor shall be responsible for obtaining all required blasting permits from the city, county, state and federal agencies and shall provide sufficient prior notice as specified by code, ordinance or other regulation to the county engineer, county sheriff, fire districts, police departments, and all other appropriate agencies and authorities where the blasting is to be performed. A copy of the blasting permit shall be on the site before and during the blasting operations. Contractor shall furnish to Owner a copy of all blasting permits at least 7 days prior to blasting.

F. Pre-blast Survey:

1. Contractor shall perform a pre-blast survey of all utilities, structures, and other facilities adjacent to the blast sites to determine the conditions of each utility, house, building, bridge, overpass, and other structures and facilities susceptible to damage from blasting operations. The preblast survey shall include all structures and utilities within a minimum of 500 feet radius of the area to be blasted. The survey notification to all property owners, tenants, utilities, and other agencies and the area of survey shall be in conformity with the requirements of the authority having jurisdiction thereover or as determined by Contractor's insurance company if no local ordinance applies. Contractor shall submit the pre-blast survey report for record purposes, to Owner at least 30 days prior to blasting.

G. Blast Monitoring:

1. Prior to the start of Contractor's blasting, Contractor shall measure background ground vibrations.
2. Seismographs shall be placed on the ground adjacent to structures subjected to ground shock to measure peak particle velocity components in three mutually perpendicular directions during blasting operations.
3. The peak particle velocity, defined as the maximum of the three velocity components of vibration, at any location shall not exceed values that will cause damage to the adjacent structures. Air overpressure shall be measured at adjacent structures. Air overpressure at adjacent structures shall not exceed values that will cause damage to the adjacent structures or personnel. The maximum peak particle velocity and air overpressure values that will not cause damage shall be determined by the blasting engineer retained by Contractor and shall be stated in the blasting procedures.
4. Contractor shall submit measurement records of the blast monitoring to Owner for record purposes within 24 hours after each blast.

H. Post-blast Survey:

Contractor shall perform a post-blast survey of the same utilities, structures, and other facilities surveyed in the pre-blast survey to determine the effect of the blasting operations. Contractor shall submit the post-blast survey report to Owner for record purposes within 14 days after completion of blasting.

I. Unauthorized Excavation:

1. Excavation of material to depths below the grades indicated, unless so directed by the engineer will be deemed unauthorized excavation.
2. Unauthorized over-excavation shall be backfilled and compacted without any additional expense to the owner.

J. Authorized Over-Excavation:

1. In the event that it is necessary to remove unsuitable material to a depth greater than that shown on the drawings or otherwise specified, the contractor, upon receiving direction from the engineer, shall remove, replace and compact such material as directed by the engineer at the unit prices indicated in the bid form.

3.6 FILLING AND BACKFILLING

A. Use fills formed of suitable material placed in layers of not more than 8" in depth measured loose and rolled and/or vibrated with suitable equipment until compacted.

B. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.

C. Do not use broken concrete or asphaltic pavement in fills.

D. Selection of Borrow Material:

1. Material in excess of that available on the site shall be suitable material furnished by the contractor from private sources selected by the contractor. The material shall be approved by the engineer before use. All expenses involved in securing, developing, transporting and placing the material shall be borne by the contractor.

E. Placing and Compacting:

1. Place backfill and fill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for the area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.

F. Moisture Control:

1. Do not use soil material that is either too dry or too wet to achieve proper compaction.
2. Where subgrade or layer of soil material is too dry to achieve proper compaction, uniformly apply water to surface of soil material such that free water does not appear on the surface during or subsequent to compacting operations.

3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
4. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by dicing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the engineer.

G. Compaction Requirements:

1. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor). Moisture content of the fill, while it is being compacted, shall be within 3% of the standard proctor optimum moisture content.
- 2.
3. Fill beneath structures and beneath an area extending 10' beyond the limits of the foundation:
 - a. Top 12" of subgrade 98%
 - b. All other fill material 95%
4. Fill beneath roadway:
 - a. Top 12" of subgrade 98%
 - b. All other fill material 95%
5. Embankments:
 - a. Top 12" of subgrade 98%
 - b. All other fill material 95%
6. Fill beneath walkways:
 - a. Top 12" of subgrade 95%
 - b. All other fill material 90%
7. Lawn and unpaved open areas:
 - a. All other fill material 90%

3.7 PLACING SPECIAL MATERIALS

- A. Placing Impervious Liner Materials:
1. Place selected fine grain soils on bottom and side slopes of the basin to the indicated depth.
 2. Inspect and proofroll the stripped and grubbed subgrade prior to placement of any liner material, as specified hereinafter.
 3. Spread liner material in 8" maximum, loose lift thickness to provide a 6" compacted lift thickness.
 4. Adjust soil moisture content to 1 to 3 percentage points "wet" of the optimum moisture contents.
 5. Compact at 98% of maximum density.
 6. Maintain liner material sufficiently moist to prevent drying and cracking, until such time as the basin is filled.

3.8 FINISH GRADING

- A. General:
1. Uniformly grade the areas within limits of grading under this section, including adjacent transition areas.
 2. Smooth the finished surfaces within specified tolerance.
 3. Grade with uniform levels or slopes between points where elevations are shown on the drawings, or between such points and existing grades.
 4. Where a change of slope is indicated on the drawings, construct a rolled transition section having a minimum radius of approximately 8'0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.
- B. Grading Adjacent to Structures: Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.
- C. Ditches and Gutters and Swales:
1. Cut accurately to the cross sections, grades and elevations shown.
 2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the work.
 3. Dispose of excavated materials as specified herein; do not in any case deposit materials within 3'0" of the edge of a ditch.

3.9 FIELD QUALITY CONTROL

- A. Secure the engineer's inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon.
- B. Field density determinations will be made, at no cost to the contractor, to insure that the specified densities are being obtained. Field density tests will be performed as determined by the engineer, considering the following:
 - 1. At areas to receive paving, at least one field density test for every 5,000 sq.ft. of subgrade area, but not less than three tests.
 - 2. In each compacted fill layer, one field density test for every 5,000 sq.ft. of overlying paved area, but not less than three tests.
 - 3. In fill beneath structures, one field density test for every 2,500 sq.ft. in each layer.
 - 4. Other tests as deemed necessary by the engineer.
- C. If, in the engineer's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing until specified requirements are met.
 - 1. Additional testing will be provided by the owner's selected testing laboratory and all costs for the additional testing will be borne by the contractor.
- D. Proofrolling:
 - 1. The contractor shall proofroll subgrade of areas to receive paving, structures on fill or impervious lining material.
 - a. Make not less than 3 passes of a 25 to 50 ton rubber tired roller over the full area.
 - b. Unstable, soft or otherwise unsuitable materials revealed by the proofrolling shall be removed and replaced with satisfactory materials, compacted as specified herein.

3.10 PLACING TOPSOIL

- A. Upon completion of site grading and other related site work, topsoil shall be uniformly spread over the graded or improved areas. Topsoil shall be evenly distributed to conform to final grade elevations shown on the plans.
- B. Place, level and lightly compact topsoil to a depth of not less than 3".
- C. Maintain topsoil free of roots, rocks, debris, clods of soil and any other objectionable material which might hinder subsequent grassing or mowing operations.
- D. Any surplus materials shall be disposed of in approved areas on the site.

3.11 MAINTENANCE

- A. Protection of Newly Graded Areas:
 - 1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.
 - 2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.
- B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.12 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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PART 1 - GENERAL**1.1 DESCRIPTION**

- A. Work Included: Excavating, backfilling, compacting and grading to build the structures as shown on the drawings, as specified herein, and as needed to meet the requirements of the construction shown in the contract documents.
- B. Related Work:
1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.
 2. Section 02310: Site Grading.
 3. Section 02260: Erosion and Sediment Control
- C. Classification: Material determined by the Engineer to be rock as defined herein will be classified as "Rock Excavation".
1. Excavation of rock not indicated on the drawings will be paid for at the unit price indicated on the bid form.
 2. Where rock is shown on the drawings, excavation of this material shall be included in the lump sum price bid for the work and no additional payment will be made for this material.
 3. Where actual rock excavation required and performed is less than that which is indicated on the drawings, the Owner shall receive a deductive amount based on the unit price indicated on the bid form.
 4. Quantities for additional or deductive rock excavation shall be as determined by the Engineer from field measurements.
 5. Do not perform any additional rock excavation without prior approval of the Engineer.
- D. Definitions:
1. Open Areas: Open areas shall be those areas that do not include building sites, paved areas, street right-of-way, and parking areas.
 2. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.
 3. Optimum Moisture: Percentage of water in a specific material at maximum density.
 4. Rock excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges,

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chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation. The reference excavating machinery for this definition is a Caterpillar CAT 330 excavator (59,750-lb maximum drawbar pull) or other equipment with equivalent drawbar pull. Any material that cannot be excavated with the reference machinery is considered rock.

5. **Unsuitable Material:** Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, roots, and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
6. **Suitable Material:** Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.
7. **Select Material:** Select material is defined as granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1½ inch in diameter.
8. **Crushed Stone (gravel):** Crushed stone shall be No. 57 aggregate or equal conforming to ASTM C-33.
9. **Excavation:** Excavation is defined as unclassified excavation of every description regardless of materials encountered.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Comply with requirements of governmental agencies having jurisdiction.
- C. **Testing:** A testing laboratory retained by the Contractor and approved in writing by the Engineer will make such tests as are deemed advisable.
 1. Schedule fill and backfill operations so as to permit a reasonable time for inspection and testing before placing succeeding lifts and keep the laboratory and Engineer informed of progress.
 2. Notify the Engineer and allow sufficient time for inspection and/or testing of foundation sub-grades prior to commencing any work on the exposed excavation.

EXCAVATING/BACKFILLING FOR STRUCTURES

1.3 JOB CONDITIONS

- A. If, in the opinion of the Engineer, conditions encountered during construction warrant a change in the footing elevation, or in the depth of removal of unsuitable material from that indicated on the drawings, an adjustment will be made in the contract price based upon unit prices for additional work as contained in the bid form.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Soil material used as fill, backfill or sub-grade for structures shall consist of suitable material.
 - 1. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2" in their greatest dimension.
 - 2. Do not permit rocks having a dimension greater than 1" in the upper 6" of fill or sub-grade.
- B. Where select material is indicated on the drawings or specified, use select granular material as defined herein and approved by the Engineer.
- C. Where indicated on the drawings or specified, use gravel or crushed stone as defined herein.
- D. Where indicated on the drawings, provide a lean concrete "mud slab" beneath foundations.
 - 1. Use 2000 psi concrete and a minimum thickness of 2".
 - 2. With prior approval of the Engineer, a "mud slab" may be substituted for gravel base material except where the gravel base is required for drainage or for use with pressure relief valves.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Protection of Persons and Property:
 - 1. Protect structures, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

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2. Unless shown to be removed, locate and protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
 3. If active utility lines are encountered and are not shown on the drawings or otherwise made known to the Contractor, promptly notify the Engineer and take necessary steps to assure that service is not interrupted.
 4. Barricade open holes and depressions occurring as part of this work, and post warning lights on property adjacent to or with public access. Operating warning lights during hours from dusk to dawn each day and as otherwise required.
 5. Side Slopes: Slope, bench and/or shore sides of excavations and trench walls to maintain stability of the wall or sides. Pile materials obtained from the excavation a minimum of four feet from the edge of the excavation.
 6. Shoring and Sheeting: Where necessary, shore and sheet excavations with members of sizes and arrangement sufficient to prevent injury to persons, damage to structures or injurious caving or erosion.
 - a. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage. Any movement or bulging which may occur shall be corrected immediately by the Contractor. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted.
 - b. Take all precautions to prevent distress of existing structures because of sheeting installation or removal. Where the removal of sheeting may cause damage to existing or newly constructed structures, such sheeting shall be left in place at no expense to the Owner.
 - c. All sheeting and shoring operations and maintenance thereof shall be the responsibility of the Contractor.
- B. Excavating: Perform excavating of every type of material encountered to the lines, grades and elevations indicated or as necessary for construction of the structures shown.
1. Conform to elevations and dimensions shown within a tolerance of 0.10', and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for inspection.
 2. Where earth will stand, shallow footing excavations may be cut to the exact size of the footing.
 3. Separate suitable materials and stockpile for future use.
 4. Dispose of unsuitable material and excess suitable material.

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- C. Foundation Sub-Grades: Excavate foundations and footings to a level bottom in firm, solid, suitable material.
1. Take care not to disturb the bottom of the excavation unless further compaction of the sub-grade is required.
 2. Notify the Engineer in due time to permit inspection of the completed excavation prior to performing work on the foundation sub-grade.
 3. Should unsuitable or soft material be encountered at sub-grade elevation, remove such material and replace with compacted suitable material or crushed stone from firm earth up to the indicated elevation.
 - a. In wet excavations or where groundwater is normally present, replace unsuitable material with crushed stone or lean concrete.
 - b. In dry excavations above the normal groundwater level, replace unsuitable material with compacted suitable material.
 - c. Removal and replacement of unsuitable material shall be paid for at the unit prices for such work as stated in the bid form.
 4. Where rock is encountered at foundation level:
 - a. Use drilling, picking, wedging or similar methods leaving the foundation rock in an entirely solid and unshattered condition.
 - b. Roughen approximately level surfaces to provide satisfactory bond with concrete.
 - c. Cut steps or benches in sloped surfaces to provide satisfactory bond.
- D. Drainage: Provide drainage and control grading in the vicinity of the work to prevent drainage into the excavation.
- E. Rock Excavation:
1. Notify the Engineer upon encountering rock or similar material which cannot be removed or excavated by conventional earth moving or ripping equipment.
 2. Do not use explosives without written permission from the Engineer.
 3. When explosives are permitted, use only experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Store, handle and use explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.
 4. The Contractor shall be solely responsible for any damage resulting from the use of explosives.

EXCAVATING/BACKFILLING FOR STRUCTURES

5. The Contractor is responsible for securing all permits required in performing this work.
 6. Do not use blasting adjacent to existing buildings or structures.
 - a. Remove rock at such locations using jack hammers and bull points.
- F. Unauthorized Excavation:
1. Excavation of material to depths below the grades indicated unless so directed by the Engineer will be deemed unauthorized excavation.
 2. Backfill and compact unauthorized excavation at no expense to the Owner.
 - a. In wet excavations or excavations below normal groundwater elevations: Use crushed stone or lean concrete as directed by the Engineer.
 - b. In dry excavations above normal groundwater elevations: Use compacted suitable material.

3.2 DEWATERING

- A. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry condition during construction operations.
- B. Maintain the water level below the excavation sub-grade during excavation and construction.
 1. Material disturbed below the foundation sub-grade due to improper dewatering shall be removed and replaced with crushed stone or lean concrete at no expense to the Owner.
 2. Use sumps, pumps, drains, trenching or well point system as necessary to maintain a dry excavation.
 3. Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.
- C. Dispose of water pumped from excavations in storm drains having capacity, canals, trenches or other approved locations.
 1. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the operation.
 2. Prevent flooding of streets, roadways, or private property.
 3. Provide engines driving dewatering pumps with residential type mufflers.

3.3 BACKFILLING, FILLING AND COMPACTION

- A. Use suitable material for all filling and backfilling operations.

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- B. Fill Under Structures: Deposit suitable material in layers not exceeding 8" in depth and compact each layer using proper equipment.
1. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.
 2. Do not place broken concrete, bricks, or asphaltic pavement in fills.
 3. Where indicated on the drawings, provide select granular material.
- C. Backfill excavations as promptly as progress of the work permits, but not until completion of the following:
1. Inspection and acceptance of construction below finish grade, including where applicable, damp-proofing and waterproofing.
 2. Inspecting, testing, approving and recording locations of underground utilities.
 3. Removing concrete formwork.
 4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.
 5. Removing trash and debris.
 6. Foundation walls have been in place seven days.
- D. Placing and Compacting:
1. Place backfill and fill materials in layers not more than 8" in loose depth.
 2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content within 2%.
 3. Compact each layer to required percentage of maximum density for area.
 4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
 5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
 6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
 7. Do not operate heavy equipment closer to foundation or retaining walls than a distance equal to height of backfill above the footing.
 - a. Compact remaining area using power driven hand tampers.

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8. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.
- E. Compaction Requirements:
1. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698 (Standard Proctor). Moisture content of the fill, while it is being compacted, shall be within 3% of the standard proctor optimum moisture content.
 2. Existing in place sub-grade below structures where sub-grade has been disturbed by water, improper dewatering, or construction traffic.
 - a. Top 12" of sub-grade 98%
 - b. Below top 12" of sub-grade 95%
 3. Fill beneath structures and beneath an area extending 10 feet beyond the limits of the foundation:
 - a. Top 12" of sub-grade 98%
 4. Compaction of suitable material used to replace unsuitable material below foundation sub-grades:
 - a. Top 12" of sub-grade 98%
 - b. Below top 12" of sub-grade 95%

3.4 FIELD QUALITY CONTROL

- A. Secure the Engineer's inspection and approval of sub-grades and fill layers before subsequent construction is permitted thereon.
- B. Field density determinations will be made, at no additional cost to the Owner, to insure that the specified densities are being obtained. Field density tests will be performed as determined by the Engineer, considering the following:
 1. At areas to receive paving, at least one field density test for every 5000 sq.ft. of sub-grade area, but not less than three tests.
 2. In each compacted fill layer, one field density test for every 5000 sq.ft. of overlaying paved area, but not less than three tests.
 3. In fill beneath structures, one field density test for every 2,500 square feet in each layer.
 4. Other tests as deemed necessary by the Engineer.

EXCAVATING/BACKFILLING FOR STRUCTURES

- C. If, the Engineer's opinion based on reports of the testing laboratory, sub-grade or fills that have been placed are below specified density, provide additional compacting and testing until specified requirements are met.
 - 1. Additional testing will be provided by the Owner's selected testing laboratory and all costs for the additional testing will be borne by the Contractor.
 - 2. Any costs for required testing in excess of the stated cash allowance will be borne by the Contractor.
- D. Proof-Rolling:
 - 1. Upon request by the Engineer, proof-roll the sub-grade of structure foundations.
 - a. Make not less than three passes of a 25 to 50 ton rubber tired roller over the full area.
 - b. Unstable, soft or otherwise unsuitable materials revealed by the proof-rolling shall be removed and replaced with satisfactory material and compacted as specified herein.

3.5 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide asphaltic concrete paving where shown on the Drawings, as specified herein, as needed for a complete and proper installation, and where damaged during the course of construction activities.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 02310-Site Grading.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within fifteen (15) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Certificates, signed by the materials producer and the asphalt-paving Subcontractor, stating that materials meet or exceed the specified requirements.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and products used shall comply with pertinent sections of the South Carolina Department of Transportation's (SCDOT) "Standard Specifications for Highway Construction", current edition.

2.2 ASPHALTIC CONCRETE MIXTURE

- A. Materials and composition of mixture shall comply with Section 403 of the SCDOT "Standard Specifications for Type 1 Mix".

- B. Provide hot plant mixed asphaltic concrete paving materials.
 - 1. Temperature leaving the plant: 290°F minimum, 320°F maximum.
 - 2. Temperature at time of placing: 280°F minimum.

2.3 EQUIPMENT

- A. Comply with requirements of Section 401 of SCDOT's "Standard Specifications".

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
 - 1. Sweep primed surfaces if needed.
 - 2. Adjust frames and covers if needed.

3.2 WEATHER RESTRICTIONS

- A. Do not apply asphalt mixtures to a wet or frozen surface or when air temperature is below 40° F in the shade and falling, or below 35°F in the shade and rising.

3.3 SPREADING AND FINISHING

- A. On arrival at point of use, dump directly into mechanical spreader.
- B. Immediately spread and strike off true to the line, grade and cross section indicated, to such loose depth that when work is completed, the indicated thickness or weight per square yard will be secured.
- C. Correct irregularities while the mixture is still hot.
- D. At locations not readily accessible to mechanical spreaders, acceptable hand spreading methods may be used.
- E. Finished surfaces placed adjacent to curbs, gutters, manholes, etc., shall be approximately ¼ inch above the edges of these structures.

3.4 COMPACTION

- A. Perform initial rolling with 3-wheel steel roller or a steel wheel 2-axle tandem roller.
- B. Follow initial rolling with at least four complete coverages by a pneumatic tired roller.
- C. Complete rolling with steel wheel 2-axle tandem roller.

ASPHALTIC CONCRETE PAVING

- D. Rolling shall start longitudinally at the sides and proceed gradually toward the center of the pavement, overlapping on successive trips approximately $\frac{1}{4}$ the width of the roller.
- E. Use hand or mechanical tampers in areas not accessible to powered rollers.
- F. Surface mixture after compaction shall be smooth and true to the established crown and grade.
- G. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.
- H. Finished paving smoothness tolerance:
 - 1. Free from birdbaths.
 - 2. No deviations greater than $\frac{1}{4}$ inch in 10 feet.

3.5 PROTECTION OF SURFACE

- A. Allow no traffic on surface until the mixture has hardened sufficiently to prevent distortion.

3.6 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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PART 1 - GENERAL

1.1 PURPOSE

This section of the specification describes products to be incorporated into the sewers and requirements for their installation and use. The Contractor shall furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

1.2 GENERAL

- A. Applicable Standards: Reference Section 01091.
- B. Substitutions: Reference General Conditions. Any item or product other than those so designated shall be considered a substitution. The Contractor shall obtain prior approval from the Owner for all substitutions.
- C. Warranty: Reference Section 01740.

PART 2 - MATERIALS

2.1 PIPE AND ACCESSORIES

- A. All pipe shall be subject to the inspection of the Owner at the pipe plant, jobsite, or other point of delivery for the purpose of rejecting pipe not conforming to these Specifications.
- B. Pressure Pipe for Force Mains
 - 1. Ductile Iron Pipe: Ductile iron pipe shall be utilized in force mains, stream crossings, highway and railroad crossings, all piping inside (carrier pipe) steel casing, and other locations as indicated on the Construction Drawing. All pipe shall be furnished in lengths of at least 18 feet.
 - a. Pipe: Ductile iron pipe shall conform to AWWA C151. Pipe and fittings shall be furnished with a bituminous outside coating. The interior of the pipe and fittings shall be ceramic epoxy lined (Protecto 401) in accordance with ASTM A716/746.

PIPE SIZE (IN)	PRESSURE CLASS (PSI)
4-12	350
14-62	200

- b. Joints: Joints shall be push-on type for pipe and standard mechanical joints for fittings. Joints shall conform to AWWA C111. Restrained joint pipe (RJP) shall be either the bolted joint type, or modified push-on type with joint restraint using ductile iron components. Restrained joint pipe on piers shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet. Restrained joint pipe where required shall be EBAA Iron, American, U.S. Pipe, Clow or equal. When

installed in a casing, the pipe shall be supported at every joint by a stainless steel insulator as manufactured by Cascade or an approved equal. Contractor shall install according to manufacturer's recommendations.

- c. Fittings shall be ductile iron and shall be manufactured in accordance with AWWA C110 or AWWA C153 with a minimum rated Working pressure of 250 psi.
- d. Detection Tape: Detectable mylar encased aluminum foil marking tape will be installed over all DIP sewer pipe and sewer laterals. Tape will be "safety orange" in color, at least 1-1/2-inches wide and shall bear the printed identification "Caution Buried Sewer Line Below" (reverse printed), so as to be readable through the mylar. Surface printing on the tape shall equal to Lineguard Type II Detectable.
- e. Tracer Wire. Sewer Lines and Force Mains require installation of tracer wire. Tracer wire shall be 12 AWG Solid UL/UF and run along the top of pipe, in a continuous length between valves, air release valves, and stub outs. The tracer wire shall be secured to the pipe in intervals of 10' (maximum) with wire or tape. Splices shall be made using crimped copper sleeves. Twisting wires together shall not be allowed. A minimum of 2' of extra wire shall be coiled in valve boxes and valve vaults. Tracer wire is to be certified by a licensed electrical contractor or corrosion contractor for continuity. Final acceptance will not be granted until certification is received by inspector and/or engineer.
- f. Acceptance. Acceptance will be on the basis of the Owner's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

2. PVC Pressure Pipe:

- a. PVC pipe shall conform to AWWA C900, Pressure Class 305 (DR14) for gasket joints. All pipes shall be furnished in lengths of at least 18 feet.
- b. Joints: Joint shall be gasket style using ASTM F 477, elastomeric seals.
- c. Fittings shall be ductile iron and shall be manufactured in accordance with AWWA C110 or AWWA C153 with a minimum rated Working pressure of 250 psi.
- d. Detection Tape: Detectable mylar encased aluminum foil marking tape will be installed over all PVC sewer pipe and sewer laterals. Tape will be "safety orange" in color, at least 1-1/2-inches wide and shall bear the printed identification "Caution Buried Sewer Line Below" (reverse printed), so as to be readable through the mylar. Surface printing on the tape shall equal to Lineguard Type II Detectable.

- e. **Tracer Wire:** Sewer Lines and Force Mains require installation of tracer wire. Tracer wire shall be 12 AWG Solid UL/UF and run along the top of pipe, in a continuous length between valves, air release valves, and stub outs. The tracer wire shall be secured to the pipe in intervals of 10' (maximum) with wire or tape. Splices shall be made using crimped copper sleeves. Twisting wires together shall not be allowed. A minimum of 2' of extra wire shall be coiled in valve boxes and valve vaults. Tracer wire is to be certified by a licensed electrical contractor or corrosion contractor for continuity. Final acceptance will not be granted until certification is received by inspector and/or engineer.

C. **Gravity Sewer**

- 1. **Ductile Iron Pipe:** Ductile iron pipe used in gravity sewer shall meet the same specifications as for pressure pipe.
- 2. **Polyvinyl Chloride Gravity Sewer Pipe:** PVC gravity sewer pipe shall be supplied in lengths not longer than 13 feet. The installation shall conform to requirements of ASTM D2321. Minimum depth of installation of three (3) feet. Maximum depth of installation is twenty (20) feet.
 - a. **Pipe:** PVC gravity sewer pipe shall be manufactured in accordance with ASTM D 3034, SDR 35 pipe or ASTM F 789 for pipe 4 to 15 inches in diameter, and in accordance with ASTM F 679 for pipe 16 inches and above in diameter.
 - b. **Joints:** Joints for pipe and fittings shall be of the bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage. The joint system shall be subject to the approval of the Owner and shall be identical for pipe and fittings.
 - c. **Fittings** for pipe eight inches and less in diameter shall be one piece with no solvent-welded joints. Fittings for pipe ten inches and larger may be fabricated using solvent welding. No field fabrication or fittings will be allowed. All such fabrication shall be performed at the factory and the fittings delivered ready for use.
 - d. **Detection Tape:** Detectable mylar encased aluminum foil marking tape will be installed over all PVC sewer pipe and sewer laterals. Tape will be "safety orange" in color, at least 1-1/2-inches wide and shall bear the printed identification "Caution Buried Sewer Line Below" (reverse printed), so as to be readable through the mylar. Surface printing on the tape shall equal to Lineguard Type II Detectable.
 - g. **Acceptance:** Acceptance will be on the basis of the Owner's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

- D. Plug Valves: Refer to Section 11293
- E. Check-Valves: Check valves shall be hinged disc type with cast iron body and bronze or bronze-fitted disc. Valves shall be designed for the operating head indicated and shall not slam shut on pump shutdown. Valves shall be equipped with ½-inch stop cock at the high point of the valve for bleeding air from the line.

Valves of the outside weight and lever cushioned type shall have the cushion chamber attached to the side of the valve body externally and construction with a piston operating in a chamber that will effectively prevent hammering action at the pump discharge heads specified. The cushioning shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.

Weight and lever cushioned type valves shall be manufactured by G-A Industries, Mueller, or approved equal.

- F. Automatic Air and Vacuum Valves: Valves shall be automatic air and vacuum valves designed to allow escape of air, close water-tight when liquid enters the valve, and allow air to enter in the event of a vacuum. The manhole should have stone in the bottom of manhole for drainage and be no smaller than a 60" manhole with a flat top. Two manhole covers are preferred, one for entry and one for ARV removal. The valve body shall be reinforced nylon; the valve seat and all working parts shall be of corrosion resistant materials. ARV should be stainless or H₂S resistant, nuts and bolts should also be stainless. The ARV should be connected to the FM mechanically and the isolation valve should be stainless or epoxy coated for H₂S resistance. Valves shall be recommended by the manufacturer for wastewater service. Air and vacuum valves shall be as manufactured by A.R.I. Combination Air Valve No. D-025 or approved equal.
- G. Adapter Couplings: Adapters shall be elastomeric plastic sleeves designed to connect pipes of dissimilar materials. Adapters shall provide a positive seal against infiltration and exfiltration, be root proof and remain leak proof up to 10 psi. The adapter manufacturer shall provide stainless steel clamps, adapter donuts and other required accessories.

Couplings for DI/PVC transition joints shall be ductile iron as manufactured by Dresser and shall be installed in accordance with the manufacturer's recommendations.

- H. Materials for Manholes and Wetwells: Provide materials for construction of manholes and wetwells in accordance with the following:
- a. Precast Concrete Sections: Precast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi. The minimum shell thickness shall be one twelfth of the inside diameter of the riser. Reinforcement shall meet all requirements of ASTM-A185.

Seal joints between precast sections by means of rubber "O" ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be preformed type with a minimum nominal diameter of 1-inch. Butyl rubber sealant shall be equal to Kent Seal No.2 or Kor-N-Seal 300.

- b. Dimensions: All precast manholes shall be standard 4'-0" inside diameter for pipe size 18" and smaller. Manhole base sections and adaptors shall be provided as shown on the detail drawing.
- c. Iron Castings: Cast iron manhole frames and covers shall be gray iron, conforming to ASTM A 48 for Class 25B gray iron and all applicable local standards. All castings shall be tough, close grained, smooth and free from blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95% of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop and given two coats of approved bituminous paint before rusting begins. Castings without asphalt emulsion coating are also acceptable.

Manhole frames and covers shall have nominal 24" openings for pipe sizes 24 inches and smaller and 30" for pipe sizes 30 to 60 inches, and be equal to the following:

Standard Frame and Cover shall be USF-668, KL as manufactured by U.S. Foundry or V-1384 as manufactured by East Jordan Iron Works

Waterproof Frame and Cover shall be USF-668, KL-BWTL as manufactured by U.S. Foundry or approved bolt-down unit compatible with V-1384 as manufactured by East Jordan Iron Works

Flat Slab Frame and Cover shall be USF-1261, KL as manufactured by U.S. Foundry or V-1384-4 as manufactured by East Jordan Iron Works

All frames and covers shall have machined horizontal bearing surfaces.

Bolt-down covers shall be equipped with four ½-inch stainless steel bolts and a ½-inch neoprene O-ring gasket. Covers shall be rotatable and interchangeable. Bolt holes shall be bored through so that debris entering the bolt hole will fall into the manhole.

- d. Rubber Boots: Provide preformed rubber boots and fasteners equal to those manufactured by Kor-N-Seal or Press Seal Gasket Corporation.

Provide neoprene boot seal where sewer enters manhole. Openings for pipes entering or leaving the manholes shall be core drilled at the plant or site. All pipes entering and leaving the manhole shall be provided with neoprene boot seal and shall be grouted with non-shrink grout. Hailmary seals shall be used for pipes 30" and larger. A-Lock Seals may be submitted for Hailmary Seals.
- f. Manhole Markers: Provide Carsonite CUM-375 Composite Utility markers imprinted with "SEWER PIPELINE" as manufactured by AMETEK, Inc. of Carson City, Nevada.

PART 3 - EXECUTION

3.1 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

It is the responsibility of the Contractor to locate all existing utilities along the path of his construction. Where unforeseen underground utilities or obstructions are encountered, the location and alignment of the sewer may be changed, upon written approval of the Owner, to avoid interference. If the sewer cannot be adjusted, the existing utility will be relocated by the Contractor at no additional cost to the Owner.

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall call the Palmetto Utilities Protection Service at 1-888-721-7877 and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.

- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.
 - 1. Provide the required notice to the utility owners and allow them to locate their facilities according to South Carolina law. Field utility locations are valid for only ten days after original notice. The Contractor shall ensure, at the time of any excavation that a valid utility location exists at the point of excavation.
 - 2. Expose the facility to verify its true location and grade for a distance of at least 200 feet in advance of pipeline construction. Repair, or have repaired any damage to utilities resulting from locating or exposing their true location.
 - 3. Avoid utility damage and interruption by protecting it with means or methods recommended by the utility owner.
 - 4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly or more frequently if required.

- C. Conflict with Existing Utilities
 - 1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed sewer does not permit safe installation of the sewer by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the sewer to avoid horizontal conflicts if the alignment remains within the available right-of-way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by the Engineer. Where such relocation of the sewer is not approved by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed sewer does not permit the crossing without immediate or potential future damage to the utility, main, service, or the sewer. The Contractor may change the proposed grade of the sewer to avoid vertical conflicts if the changed grade provides minimum required capacity, maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by the Engineer. Where such relocation of the sewer is not approved by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
- D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- E. Water and Sewer Separation
1. Sewers should maintain a minimum 10-foot edge-to-edge separation from water mains. When running parallel to a water main, if a separation of less than 10 feet is indicated in the plans or required by conditions, Ductile Iron Pipe shall be used. Where the sewer crosses a water main, an 18-inch vertical separation shall be maintained where possible. Where possible, a full joint of sewer pipe shall be centered over the water main. Any deviation shall be requested in writing to the Engineer.
 2. NO water main shall be permitted to pass through or come in contact with any part of a manhole.
- F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences, property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

3.2 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

Install pipe lines and accessories along highways, streets and roadways in accordance with the applicable regulations the SC Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.

- A. Protection of Traffic: Provide and maintain suitable signs, barricades and lights for protection of traffic. Replace all highway signs removed for construction as soon as possible. Do not close or block any highway, street, or roadway without first obtaining permission from the proper authorities.

Provide qualified/certified flagmen to direct and expedite the flow of traffic.

- B. Construction Operations: Perform all Work along highways, streets and roadways to least interfere with traffic.
1. Stripping: Where the pipe line is laid along road shoulders, strip and stockpile all sod, topsoil and other material suitable for shoulder restoration.

2. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
 3. Shaping: Reshape damaged slopes, side ditches and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.
- C. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off of the pavement.
- D. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material and free of drain at all times.
- E. Maintaining Highways, Streets, Roadways and Driveways: Maintain streets, highways and roadways in suitable condition for movement of the Work. Use steel running plate to maintain traffic until pavement replacement is completed.

Repair all driveways that are cut or damaged immediately. Maintain them in a suitable condition for use until completion and final acceptance of the Work. Saw cut all driveways, paved parking areas, paved roadways and paved sidewalks.

3.3 EXCAVATION

Excavate trenches by open cut. The Contractor shall also refer to Section 02221 for trench excavation. Perform all excavation in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), and any subsequent amendments to this Act.

- A. Dimensions: Excavate trenches to the depths shown on the drawings for each type of bedding and for manholes and other structures.

Excavate the top of the trench to any width within the construction easement which will not cause unnecessary damage to adjoining structures, roadways, pavements, utilities, trees, or private property.

If trenches are excavated to excessive dimensions or collapse because of inadequate or improperly placed bracing and sheeting, lay the pipe with the next better type of bedding. If excavation for manholes and other structures is made to excessive depth, backfill with compacted bedding material shall be required to grade.

- B. Bracing and Sheeting: When required by regulations or to prevent damage to adjoining structures, roadways, pavements, utilities, trees, or private property which are specifically required to remain, provide bracing and sheeting.
1. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.

Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the Owner it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

2. **Steel Sheet Piling:** Continuous lock joint steel sheet piling may be substituted for timber sheeting when approved by the Owner. Steel piling may be removed, without cutting, provided the rate of removal is keeping in pace with the tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the piling. Complete withdrawal of the piling in advance of the tamping and backfilling will not be permitted. Piling, where ordered to be left in place by the Owner for reasons of safety, will be cut off where directed.

C. **Dewatering Trenches:** See Section 02240.

D. **Trench Stabilization:** Wherever the material at the bottom of the trench is unsuitable for the proper installation of the pipe, the Owner will direct the removal and replacement of the unsuitable material.

When so directed, undercut the trench and backfill with bedding material. Place and compact this material to bring the trench to the required grade.

E. **Rock Excavation:**

1. **Definition of Rock:** See Section 02221, Trench and Backfilling for Utilities.
2. **Excavation:** Where rock is encountered in trenches excavate to the minimum depth which will provide clearance below the pipe barrel of 8 inches for pipe 21 inches in diameter and smaller and 12 inches for larger pipe and manholes. Remove boulders and stones to provide a minimum of 6 inches clearance between the rock and any part of the pipe or manhole.
3. **Blasting:** Provide experienced Workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all structures from the effect of the blast. Repair any resulting damage.

If the Contractor persistently uses excessive blasting charges or blasts in any unsafe or improper manner, the Owner may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

4. **Removal of Rock:** Do not use excavated rock as backfill material. Remove rock which is surplus or not suitable for use as rip rap.

3.4 BEDDING OF SEWER

Bed pipeline in accordance with ASTM C12-95 and ASTM D2487-93 and the detail drawings and the following specifications. Type 3 bedding shall be used unless soil conditions warrant a higher class bedding type. The contractor shall notify the owner or his representative immediately after encountering questionable material. Owner or Representative shall make the determination if higher type bedding is required.

A. Materials:

1. Ductile Iron Sewer: All bedding materials shall be crushed stone unless shown or specified otherwise. Crushed stone bedding material shall meet the requirements of Section 305.03 of South Carolina Department of Transportation Standard Specifications for No. 57 stone.
2. PVC: Bedding materials shall be crushed stone unless shown or specified otherwise. Crushed stone bedding material shall meet the requirements of Section 305.03 of South Carolina Department of Transportation Standard Specifications for No.78 stone.

No. 57 stone may be allowed in lieu of No. 78 stone on a case by case basis. The rock shall be carefully tamped and sliced to support the pipe uniformly. The sewer laterals under the pavement shall be bedded as stated above.

3. Manholes: Bedding materials shall be crushed stone unless shown or specified otherwise. Crushed stone bedding material shall meet the requirements of Section 305.03 of South Carolina Department of Transportation Standard Specifications for No. 57 stone.

B. General: Compact stone bedding material by tamping or slicing with a flat blade shovel. Prepare the trench bottom to support the pipe uniformly throughout its length. Provide bell holes to relieve pipe bells of all loads. If the trench is excavated to excessive width to depth, provide the next better type of bedding. In rock bed pipe in a minimum of six (6) inches of suitable earth material.

C. Bedding Classifications: All gravity sewer installations shall conform to the following bedding classifications:

1. Ductile Iron Pipe: Bedding shall be prepared according to the following classifications:

Excavate the trench to a depth of one-fourth the nominal diameter of the pipe or 4" minimum below grade and lay the pipe to line and grade on compacted stone. Place crushed stone to the full width of the trench and to a height of one-third the outside diameter of the pipe above the invert.

2. PVC Pipe: Excavate the bottom of the trench flat at a minimum depth shown on the drawings below the bottom of the pipe barrel. Place and compact crushed stone bedding material to the proper grade. Bedding shall then be carefully placed by hand and compacted to provide full support under the pipe and to a minimum depth of two inches above the crown of the pipe.

3. Description of embedment materials:

- a. Class I: Angular, ¼" to 1 1/2" graded stone, including a number of fill materials that have regional significance, such as coral, slag, cinders, crushed stone and crushed shells.

- b. Class II: Coarse sands and gravels with maximum particle size of 1 ½", including variously graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.
- c. Class III: Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included in this class.
- d. Class IV: Silt, silty clay, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class.
- e. Class V: This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rocks larger than 1 ½" in diameter, and other foreign materials. These materials are not recommended for bedding, haunching or initial backfill. The Contractor must test all earth embedment materials for suitability and classification under the Unified Soil Classification Lettering System (UCS) as identified in ASTM D2487-93 and Uni-Bell UNI-B-5-86.

Soils in Class IV and Class V are not acceptable for this project.

- D. Manholes: Excavate to a minimum of 12 inches below the planned elevation of the base of the manhole. Place and compact stone bedding material to the required grade before constructing the manhole.
- E. Force Mains: The pipe material shall be ductile iron or C900 PVC Class 200 and shall be installed in accordance with the following:
 - 1. Earth Trenches: Grade the bottom of the trench to a true line. Lay the pipe in clean bedding material, free of rock, organics, and other unsuitable materials.
 - 2. Rock Trenches: Bed the pipe in at least six (6) inches of granular earth bedding material. Backfill with the same material to at least six (6) inches.
 - 3. Wet Trenches: Do not lay pipe in water. Provide dewatering equipment to maintain a ground water level below the bottom of the pipe while pipe is being laid.
 - 4. At end of each Workday, all open end pipe shall be capped with a plug.
 - 5. Unless noted otherwise, force main bedding shall be as shown on the drawings for PVC or DIP.
- F. Compaction: Bedding under pipe and manholes shall be compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor Compaction Test, ASTM D 698.

3.5 MANHOLES

Manholes shall be located at the end of each line, at changes in grade, direction, line size, and at all intersections.

- A. Precast Concrete: Handle sections carefully to prevent cracking or chipping. Provide uniform bedding of the bottom section to prevent uneven loading. If preformed openings must be enlarged or altered, or if new openings must be made in the field, minimize the amount of material removed to provide closely matched surfaces for grouting. Install gaskets in accordance with manufacturer's recommendations to produce a watertight structure. Manhole gaskets shall be installed as an integral part of the base section for a proper seal between the pipe and the manhole.
- B. Inverts: Form channels as shown on the drawings, rounded and troweled smooth. Maintain consistent grade through the invert. Seal the connection of pipes to the manhole with brick and mortar on the inside and outside.
- C. Future Laterals: Where future laterals have been identified, provide the first length of pipe for future lateral sewers, properly laid to alignment and grade and plugged using a plug specifically designed for the size and material of the pipe. Plug the end of the pipe and at the manhole. Extend the lateral up to the road right-of-way or property line and install a cleanout at the property line.
- D. Top Elevations: Build manholes outside of paved areas to 24 inches above ground unless otherwise shown on the plans or directed by the Owner. Build manholes in paved areas flush with existing road finished grade.
- E. Drop Connections: Manholes requiring drop connections shall be shown on the drawings. Construct drop connections of the same materials as the upstream sewer and in accordance with the details.
- F. PVC Pipe Connections: Make all manhole connections to PVC pipe with the connector specified. Couplings shall be grouted into the manhole opening after jointing with the PVC pipe.
- G. Pipes in Manholes: All pipes in manholes shall be a minimum of 5 inches from the floor of the manhole to the bottom of the pipe.

3.6 LAYING PIPE

Lay the pipe to conform accurately to the alignment and grade approved by the Owner.

- A. Handling: Use suitable tools and equipment to handle and lay pipe. Prevent damage to the pipe. Examine all pipe for cracks and other defects before it is laid. Do not lay pipe or other materials which are known to be defective.

If any pipe or other material is discovered to be defective or damaged after being laid, remove and replace it.

- B. Sequence: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as

possible after laying and jointing is completed. The exposed end of installed pipe, at the close of Work each day and at all other times when Work is not in progress, must be capped with a sealed cap. If it is necessary to backfill over the end of an uncompleted pipe, close the end with a plug.

- C. **Placing and Jointing:** Clean pipe and fittings thoroughly before laying. Before making the joint, clean the sealing surfaces of dust, dirt, gravel and other foreign substances. Apply joint lubricant recommended by the pipe manufacturer.

Center the spigot end in the bell of the preceding pipe and shove home. **CARE SHALL BE TAKEN NOT TO OVER INSERT THE PIPE INTO THE BELL.** Apply moderate force to ensure proper seating. Complete jointing no later than five minutes after application of the lubricant.

Immediately after jointing, bring the pipe to final alignment and grade.

- D. **Pressure Piping:** Comply with the above when laying pressure piping. In addition, the following requirements apply:

1. Make all push-on and mechanical joints in accordance with the manufacturer's recommendations. **CARE SHALL BE TAKEN NOT TO OVER-INSERT PUSH-ON JOINTS.**
2. Take special precautions to prevent damage to the lining of ductile iron pipe.
3. Ensure that force mains are laid flat or to maintain grade as shown in the plans. Pipe laid incorrectly shall be removed and relaid.
4. Minimum depth of cover for force mains shall be four feet unless shown otherwise on the Drawings and approved by the Owner. Within DOT right-of-way, install force mains at a depth four feet below the nearest pavement edge.

- E. **Buried Valves:** Resilient sealed gate valves are to be used for force mains and in lift stations. Valves are to be equipped with appropriate end connections, glands, gaskets, bolts, valve box cover, valve operator extensions and all applicable hardware.

Valves shall be furnished with a valve box.

If cover exceeds two feet, provide an extension stem to within six inches of the surface.

Outside of structural concrete install all floor stands on an 18-inch square by 9-inch deep concrete pad to terminate the valve box and mount the floor stand.

- F. **House Connections:** Install wyes or tees in locations designated by the Owner for future connection of service lines with proper grade and alignment to the property line. Service lines shall be plugged until put into service using plugs specifically designed for the size and type of pipe. The service lines shall include provisions for cleaning out the line in case of an obstruction.

The location of stubout shall be clearly shown on the as-built drawings. A

cleanout embedded in concrete shall be installed at the property line and shall be marked on the curb where a curb is installed.

3.7 RESTRAINED JOINT PIPE AND FITTINGS

- A. Provide restrained joint pipe and fittings as indicated in the plans.
- B. Restraint devices for nominal pipe sizes 3-inch through 36-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C111/A21.11.
- C. The devices shall have a working pressure rating equal to that of the pipe on which it is used. Ratings are for water pressure and must include a minimum safety factor of 2:1 in all sizes.
- D. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.
- E. Provide “MEGALUG” as manufactured by EBAA Iron Sales, Inc. of Eastland, Texas or approved equal.

3.8 BACKFILLING

Backfill carefully to restore the ground surface to its original condition. Dispose of surplus material. Contractor shall also refer to Section 02221 for backfilling.

- A. Backfill: Place initial backfill material carefully over the bedding material covering PVC in uniform 6-inch layers to a depth of at least 24 inches above the pipe bell. Compact each layer thoroughly with suitable hand tools. Do not disturb or damage the pipe. Backfill on both sides of the pipe simultaneously to prevent side pressures. Initial backfill material is earth material excavated from the trench which is clean and free of rock, organics, and other unsuitable material. If materials excavated from the trench are not suitable for use as initial backfill material, obtain suitable materials elsewhere.

Backfill above, shall be compacted as follows:

- 1. In 6-inch layers, if using light power tamping equipment, such as a “jumping jack”,
 - 2. In two foot layers, if using heavy tamping equipment, such as hammer with tamping feet.
- B. Settlement: If trenches settle, re-fill and grade the surface to conform to the adjacent surfaces.
- C. Backfill Under Roads: Compact backfill underlying pavement to 100% and backfill under dirt and gravel roads to 98% of the maximum dry density as determined by the Standard Proctor Compaction Test (ASTM D 698).
- D. Compaction: The backfill in all the trenches shall be compacted to a minimum of 95% of the maximum dry density determined by the Standard Proctor Compaction Test (ASTM

D 698). The base material shall be compacted to 100% of Standard Proctor. The testing agency shall run as a minimum (1) Proctor for each type of soil encountered or could use "Family of Curves Method – GD-67" as approved and utilized by the U.S. Army Corps of Engineers.

During the backfilling, loose lifts shall not exceed 8 inches in thickness. Field density determination (compaction tests) should be made at a minimum of one test per 250 to 300 linear feet per two to three compacted vertical feet. This is a minimum requirement for all areas. Tests may be required for special conditions such as in streets and other critical areas. The range of moisture contents as determined in accordance with GHD-67.

Specified Compaction – Minimum trench compaction shall be:

Base Material	100%
Under Pavement (top 12")	100%
Within Road Right-of-Ways:	98%
All other areas:	95%

Contractor shall obtain the services of an independent testing laboratory approved by the Owner to perform testing to meet the above requirement.

- E. Additional Material: Where final grades above the pre-existing grades are required to maintain minimum cover, additional fill material, at no additional cost to the Owner, will be shown on the Drawings. Utilize excess material excavated from the trench if the material is suitable.

If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide suitable additional fill material.

3.9 REMOVING AND REPLACING PAVEMENT

Use a Pug Mill Rotary Drum type mixer with minimum capacity of not less than 50 tons per hour for asphalt production. Apply and compact the base in two courses by asphalt spreader equipment of design and operation approved by Owner. After compaction, the black base shall be smooth and true.

3.10 STREAM AND DITCH CROSSING

At all points where banks of streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, carefully compact backfill and place rip rap to prevent subsequent settlement and erosion.

This requirement applies equally to Construction alongside a stream or drainage ditch as well as crossing stream or drainage ditch. Place rip rap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. Extend rip rap from 1 foot below stream bed to top of bank. Place to conform to the natural slope of the stream bank. The pipe material for stream and ditch crossing shall be ductile iron pipe. A geofabric shall be placed over the entire ditch and extend outward on either side a minimum of ten (10) feet under the rip rap.

Use only one method, either (A) or (B), throughout the job.

- A. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall 2.0 or higher.

Minimum weight of individual stones shall be 50 pounds. The maximum allowable dimension for an individual stone is 24 inches. The minimum allowable dimension for an individual stone is 6 inches. At least 50% of the stones shall have a minimum dimension of 12 inches.

Imbed stone rip rap by hand on geofabric so as to form a compact layer at least 12 inches thick. Place rip rap in such a way that the smaller stones are not segregated but evenly distributed. Place chinking stones in the crevices between the larger stones so that a dense, well graded mass is produced.

- B. Sand-Cement Bag Rip Rap: Use cement sacks or burlap bags having a capacity of from 1 to 2 cubic feet. Do not use bags previously used for sugar or chemicals.

Fill bags with a mixture of one part Portland Cement to five parts sand.

Imbed bags by hand to form a compact layer at least 12 inches thick. Place with overlapping joints. The finished surface shall not deviate from that specified by more than 3 inches at any point.

3.11 INSPECTION AND TESTING

The Owner reserves the right to periodically inspect construction methods to insure compliance with these specifications. Sewer lines and related facilities may be inspected and tested by the Owner before acceptance or tie-in to the Owner's system is permitted. All lines must be clean and all obstructions removed prior to inspection and testing. When requested by the Owner, flush out lines and manholes before testing and inspection.

The Owner will televise for construction or material defects and will randomly check PVC sewer for excessive deflection.

- A. Gravity Sewer: Pipe lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection. Televising of the sewer lines is required by the Owner prior to final acceptance after other tests are completed.

1. Pipe joints for sewers 42 inches in diameter and larger shall be air tested individually. The joint tester assembly shall be placed over the joint and shall pressurize the joint area to 4 psi. The pressure shall not drop more than 2 psi in 10 seconds. The joint tester assembly shall be equal to Cherne Industries, Inc. and shall be provided by the Contractor. Sewer 36 inches in diameter and smaller may be air tested from manhole to manhole.

2. Exfiltration Tests:

- a. Low-Pressure Air Test:

- (1) Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or

while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using Air-Lock balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in accordance with ASTM C 828 is as follows.

<u>Nominal Pipe Size, In.</u>	<u>T (time) Min./100'</u>	<u>Nominal Pipe Size, In.</u>	<u>T (time) Min./100'</u>
8	1.2		
10	1.5		
12	1.8	33	5.4
15	2.1	36	6.0
18	2.4	39	6.6
21	3.0	42	7.3
24	3.6	48	8.6
27	4.2	54	9.8
30	4.8	60	12.0

- b. Required test equipment, including Air-Lock balls, braces, air hose, air source, timer, rotometer as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge with gradations in 0.1 psi and accuracy of plus or minus 2 percent, shall be provided by the Contractor.
3. The Contractor shall keep records of all tests made. Copy of such records will be given to the Engineer or the Owner. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the Engineer. All testing shall be witnessed by the Owner or his duly appointed representative.
4. The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.
5. PVC Deflection Test: Test PVC gravity sewer for excessive deflection by passing a mandrel through the line with a diameter equal to 95 percent of the normal inside diameter of the pipe. The test shall be performed by the Contractor in accordance with ASTM D3034-94, ASTM F679-89, ASTM 2122-90, and in accordance with pipe manufacturer's recommendations. Excavate and reinstall properly any section of pipe not passing this test. Re-test until results are

satisfactory. This test shall be performed within the first 30 days of installation and during final inspection, at the completion of this contract.

B. Force Main Pressure and Leakage Test:

1. All sections of pipeline subject to internal pressure shall be pressure tested in accordance with AWWA C 600. A section of line will be considered ready for testing after completion of all thrust restraint and backfilling. Each segment of pipeline between line valves shall be tested individually.
2. Test Preparation:
 - a. Flush pipeline section thoroughly at flow velocities adequate to remove debris from pipe and valve seats. Partially operate valves and hydrants to clean out seats. Provide correctly sized temporary outlets in number adequate to achieve flushing velocities.
 - b. Provide temporary blocking, bulkheads, flanges and plugs as necessary to assure all new pipe, valves and appurtenances will be pressure tested.
 - c. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Unless permanent air vents are in place, insert temporary corporation stops at highpoints to expel air as line is filled with water.
 - d. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure. Differential pressure at valves and hydrants shall equal the maximum possible, but shall not exceed manufacturer's pressure rating.
3. Test Pressure: Test the pipeline at 150 psi measured at the lowest point for at least two hours. The test pressure shall not vary by more than 5 psi for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gauge with graduation greater than 5 psi.
4. Leakage:
 - a. Leakage shall be defined as the quantity of water that must be pumped into the test section equal to the sum of the water required to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 - b. The Owner assumes no responsibility for leakage occurring through existing valves.
5. Test Results: No test section shall be accepted if the leakage exceeds the limits determined under Section 4 of AWWA C 600. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be dug-up and repaired inside and out regardless of leakage test results.

1. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.
- C. Manholes: Prior to testing manholes for water-tightness all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass the following tests:
1. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested after to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression hade inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off with the valves closed, the time measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter manholes, 78 seconds for 60-inch diameter manholes, and 68 seconds for a combination 60-inch/48-inch diameter manhole. If the manhole fails the initial test, necessary repairs shall be made with a product approved by the Owner while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc. or Cherne Industries. All tests shall be witnessed by the Owner or his duly appointed representative.
- Testing for other diameters shall be compatible with the above criteria and as the norm for testing and in accordance with ASTM C1244-93.
- D. Wet Well: The wet well shall be prepared for testing the same as manholes except that the test shall be an exfiltration test only.

END OF SECTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide rehabilitation of sanitary sewerage system manholes and wetwell structures as shown on the drawings, specified herein, and needed for a complete and proper installation.
- B. This specification includes work, materials and equipment required for protecting and/or rehabilitating of concrete, brick, and masonry manholes and other underground vaults by the application of appropriate materials to eliminate infiltration, provide corrosion protection, repair voids and deteriorated surfaces and to enhance structural integrity, where indicated on the Contract Drawings. Procedures for surface preparation, cleaning, application and testing are described herein.
- C. The lining system shall provide a monolithic multi-layer/component lining and cover the entire chimney, walls and benches of the manholes and vaults to provide infiltration and corrosion protection as a total system. Work includes, but is not limited to, the following:
 - 1. Manhole cleaning of sedimentation and debris
 - 2. The removal of any loose and unsound material.
 - 3. Performing surface preparation for the lining application.
 - 4. Applying patching products.
 - 5. Manhole lining.

1.2 REFERENCES

- A. Reference Standards of the American Society of Testing of Materials (ASTM)
- B. ASTM D638 - Tensile Properties of Plastics.
- C. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics.
- D. ASTM D695 - Compressive Properties of Rigid Plastics.
- E. ASTM D4541 - Pull-off Strength of Coatings Using a Portable Adhesion Tester.
- F. ASTM D2584 - Volatile Matter Content.
- G. ASTM D2240 - Durometer Hardness, Type D.
- H. ASTM D543 - Resistance of Plastics to Chemical Reagents.
- I. ASTM C109 - Compressive Strength Hydraulic Cement Mortars.
- J. ASTM C348 - Flexural Strength Hydraulic Cement Mortars.
- K. ASTM C396 - Compressive Strength of Cement Mortars.
- L. ACI 506.2-77 - Specifications for Materials, Proportioning, Application of Shotcrete.
- M. ASTM C579 - Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars.
- N. NACE - The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
- C. Letter of Certification from the manufacturer regarding personnel performing the work.
 - D. Submit product data for each component specified including data substantiating that the proposed materials comply with specified requirements and recommendations by the manufacturer cover all materials.
 - E. Submit technical data, and Safety Data Sheet (SDS) on each product used.
 - F. Submit manufacturer's literature or specifications including surface preparation, application information, curing period, and testing.
 - G. Submit copies of independent testing performed on the coating product including ASTM G210-13 and ASTM D543 indicating the product meets the requirements as specified herein.
 - H. Submit technical data sheet and project specific data for repair materials to be top coated with the coating products including application, cure time and surface preparation procedures.
 - I. Samples of the cured system to include the following:
 1. Finish material.
 2. Stepped samples showing stages of multi-layer/component applications.

1.4 QUALIFICATION

- A. Manufacturer and Contractor specializing in the performance of work specified in this section with a minimum of three (3) years documented experience and 3,000 vertical feet of application.
- B. Submit references of at least five (5) municipal sanitary sewer projects performed within the past three years. These projects must be similar in scope and complexity to the project being bid. These references shall include the following:
 1. Project title and locations.
 2. Project description.
 3. Client contact, including customer name, address, and contact.

1.5 QUALITY ASSURANCE

- A. Coating material shall be produced in an ISO 9001 certified facility.
- B. Furnish materials of quality required by ASTM standards or other approved standards and specifications.

- C. Coating products shall be capable of being installed and curing properly within the specified environments. Coating products shall be resistant to all forms of chemical or bacteriological attack normally found in municipal sanitary sewer systems and capable of adhering to the substrates and repair products.
- D. Repair products shall be fully compatible with coating products including ability to bond effectively to the host substrate and coating products to form a composite system.
- E. Contractor shall utilize equipment for the application of the coating products which has been certified by the coating product manufacturer. Contractor shall have received training on the operation and maintenance of said equipment from the coating product manufacturer.
- F. Contractor shall be trained by, or have their training approved and certified by, the coating product manufacturer for the handling, mixing, application and inspection of the coating products to be used as specified herein.
- G. Contractor shall be trained in the use of testing or inspection instrumentation and knowledgeable of the proper use, preparation and installation of the coating products to be used as specified herein.
- H. Provide guarantee against defective materials and workmanship in accordance with the requirements of these specifications.

1.6 WARRANTY

- A. Applicator shall warrant all work against defects in materials and workmanship for a period of ten (10) years, unless otherwise noted, from the date of final acceptance of the project.
- B. Applicator shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said ten (10) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner.
- C. Manufacturer and Applicator warrant the liner system against failure for a period of 10 years. "Failure" will be deemed to have occurred if the protective lining fails to prevent the internal deterioration or corrosion of the structure or prevent groundwater infiltration. If any such failure occurs within 10 years of initial completion of work on a structure, the damage will be repaired at no cost to the Owner. "Failure" does not include damage resulting from mechanical or chemical abuse or act of God. Mechanical or chemical abuse means exposing the lined surfaces of the structure to any mechanical force or chemical substance not customarily present.

1.7 DEFINITIONS

- A. Cleaning: Removal of sand, dirt, roots, grease and all other solid or semi-solid material from the manholes as required for proper application of patching and coating products.
- B. Faults: Leaking joints, cracks, breaks or other imperfections in the manholes.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Handling: Prevent moisture damage and contamination of materials during delivery and handling.
- B. Storage: Store materials in undamaged condition with seals and labels intact as packaged by the manufacturer.
 - 1. Store liquid products protected from freezing conditions.

1.9 SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the Manufacturer. Do not apply the products of this Section to frozen surfaces.
 - 2. Do not apply coatings in rain or snow, unless structure is protected from precipitation, or when relative humidity is outside the humidity ranges required by the Manufacturer.
 - 3. Minimum Application Temperatures for coatings: as required by Manufacturer's instructions.
- B. Protection:
 - 1. Public Safety: If public safety is endangered during the progress of the rehabilitation work, provide adequate protective measures to protect public pedestrian and vehicular traffic on streets and walkways.
 - a. Signs, signals and barricades used shall conform to requirements of Federal, State and Local laws, rules, regulations, precautions, orders, and decrees.
 - 2. Existing Facilities Protection: Protect manholes and sewer main piping from damage due to operations associated with work of this Section.
 - 3. Personnel Protection: It is the responsibility of the Contractor to provide appropriate protective measures to ensure that chemicals are always under the control of the Contractor and are not available to unauthorized personnel or animals.

1.10 ORDER AND ACCEPTANCE OF WORK

- A. Engineer shall direct on what manhole or street the Contractor shall work and the order thereof.
- B. Owner reserves right to accept and use any portion of Work whenever it is considered to be in the public interests to do so.

1.11 PROTECTION OF OTHER UTILITIES

- A. Location:
 - 1. Approximate location of certain known underground lines is shown.
 - 2. Existing small lines not shown.
 - 3. Locate small and other possible utility lines using electronic pipe finder, or other approved method.
 - 4. Excavate and expose existing underground utilities ahead of trenching operations.
- B. Repair or replace any damaged utility line or structure at no additional cost to Owner.

1.12 JOB CONDITIONS

- A. Work under this Section may require construction or work in a confined space, defined as any space having one or more of the following characteristics:
 - 1. Limited openings for entry and exit.
 - 2. Unfavorable natural ventilation.
 - 3. Not designed for continuous worker occupancy.
- B. The Contractor shall have on the job site at all times the following minimum safety equipment:
 - 1. Gas monitor capable of testing and detecting for combustible gas, oxygen deficiency and hydrogen sulfide.
 - 2. Confined space access and retrieval winch system.
 - 3. Ventilating fan with large diameter ventilating hose.
 - 4. Supplied air respirator, MSHA/NIOSH approved type.
 - 5. Safety harness and lifelines.

This equipment to be available for use by the Contractor, Engineer and Owner for the duration of the project.

- C. All entries into or work within confined spaces to be conducted in accordance with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health [DHHS (NIOSH)] Publication No. 87-113, A Guide to Safety in Confined Spaces.

PART 2 - MATERIALS

2.1 EXISTING MATERIALS

- A. Standard Portland cement or new concrete (not quick setting high strength cement) must be well cured prior to application of the protective coating. Generally, 28 days is adequate cure time for standard Portland. If earlier application is desired, compressive or tensile strength of the concrete can be tested to determine if acceptable cure has occurred. (Note: Bond strength of the coating to the concrete surface is generally limited to the tensile strength of the concrete itself. Engineer may require Elcometer pull tests to determine suitability of concrete for coating)
- B. Cementitious patching and repair materials should not be used unless their manufacturer provides information as to its suitability for topcoating with an epoxy coating. Project specific submittals should be provided including application, cure time and surface preparation procedures which permit optimum bond strength with the epoxy coating.
- C. Remove existing coatings prior to application of the new protective coating. Applicator is to maintain strict adherence to applicable NACE and SSPC recommendations with regard to proper surface preparation and compatibility with existing coatings.

2.2 REPAIR MATERIALS

- A. Infiltration control shall be achieved using one of the following methods:
 - 1. A premixed, fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents may be used. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas forming agents or promote the corrosion of steel it may come into contact with. Set time (ASTM C-191) shall be approximately 1 minute. Ten-minute compressive strength (ASTM C-109) shall be a minimum of 500 psi. Acceptable products shall be:
 - a. CEMTEC, manufactured by A.W. Cook, Hoschton, Ga.;
 - b. Quadex Quad-Plug, manufactured by Quadex, Inc., Maumelle, Arkansas,
 - c. Thoroc Plug manufactured by ChemRex, Shakopee, MN
 - d. Approved equal products;
 - 2. A silicate-based liquid accelerator, field mixed with neat Portland cement. The set time shall be approximately 1 minute.
 - 3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or resin-rod with polyurethane resin (water activated)
 - 4. Chemical injection grout sealants which shall be applied according to the manufacturer's recommendations. Acceptable products shall be:
 - a. AV-100 Acrylamide Gel, AV-118 Acrylic Gel, or AV-202 Multigrout Urethane Resin manufactured by Avanti International,

- b. Prime-Flex 900 XLV, Prime-Flex Hydrogel SX, manufactured by Prime Resins, Conyers, GA
 - c. HYDRO ACTIVE Combi Grout, HYDRO ACTIVE cut, HYDRO ACTIVE Flex LV, HYDRO ACTIVE Multi-gel NF, or HYDRO ACTIVE Safeoam, manufactured by De Neef Construction Chemicals, Houston, TX
 - d. Approved equal products.
5. Regardless of the method (or combination of methods) which are used, the Contractor shall demonstrate that permanent elimination of all infiltration has been achieved prior to the application of additional repair, rehab or protective coatings.
- B. Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the Engineer and protective coating applicator. Repair materials must be compatible with the specified epoxy coating and shall be applied in accordance with the manufacturer's recommendations. The following products may be accepted and approved as compatible repair basecoat materials for epoxy topcoating for use within the specifications:
1. 100% solids epoxy grout specifically formulated for epoxy topcoating compatibility. The epoxy grout manufacturer shall provide instructions for trowel or spray application and for epoxy topcoating procedures.
 2. Factory blended, rapid setting, high early strength, non-shrink repair mortar that can be trowelled or pneumatically spray applied may be approved if specifically formulated to be suitable for epoxy, urethane or polyurethane topcoating. Such repair mortars should not be used unless their manufacturer provides information as to its suitability for topcoating with an epoxy, urethane or polyurethane coating. Project specific submittals should be provided including application, cure time and surface preparation procedures which permit optimum bond strength with the epoxy, urethane or polyurethane coating.
 3. A premixed non-shrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel it may come into contact with. Set time (ASTM C-191) shall be less than 30 minutes. One hour compressive strength (ASTM C-109) shall be a minimum of 200 psi, and the ultimate compressive strengths (ASTM C-109) shall be a minimum of 5000psi. Bond strengths (ASTM C-882) Modified shall be a minimum of 1700 psi.

2.2 PROTECTIVE LINING SYSTEM MATERIALS

- A. The protective lining system shall be a multi-layer/component protective lining system.
- B. The specified system is OBIC Armor 1000 manufactured by OBIC, LLC (or approved equal). The system shall include the following:

1. Polyurea Adhesion Coating
2. Polymer Surfacing Layer
3. Final Polyurea Armor Layer

C. Liner System Armor Layer:

100% solids, no volatile organic compound (VOC), moisture tolerant, elastomeric polyurea coating to provide infiltration and corrosion protection. Material shall be capable of curing properly given the project site conditions and temperatures conforming to the following minimum physical requirements:

Property	Value
Hardness, D-2240	D 52
Tensile strength, D-412	4000 psi
100% Modulus, D-412	1460 psi
200% Modulus, D-412	1960 psi
300% Modulus, D-412	2650 psi
Tear strength, DIE-C, D-624	445 pli
Ultimate elongation, D-412	425 %
Abrasion Resistance (CS17 wheels, 1000g, 1000 cycles), D-4060	23 mg loss
ASTM G210-13 Severe Wastewater Analysis Testing	Pass

D. Liner System Surfacing Layer:

100% solids, no volatile organic compound (VOC), moisture tolerant, elastomeric polyurethane coating to provide infiltration and corrosion protection. Material shall be capable of curing properly given the project site conditions and temperatures conforming to the following minimum physical requirements:

Product Type	Polyurethane	
Core Density	ASTM D 1622	6 pcf
Compressive Strength 1"	ASTM D 1621	130 - 180 psi

- E. OBIC 1000 (or approved equal) Aromatic Polyurea (Adhesion Layer) - apply in a single monolithic layer to a nominal dry film thickness of 50 mils using a high-pressure plural component Graco Reactor or a similar plural spray reactor at a pressure of 2000 to 2500 psi. OBIC Aromatic Polyurea dries to tack-free in minutes. Visual inspection and testing can be performed at the convenience of the client's inspector.
- F. OBIC 1306 (or approved equal) Closed Cell Foam Surfacer (if required) - apply using high pressure plural component proportioning equipment with primary and hose heaters at 120 - 140° F and pressure settings at 1000 psi. Apply foam at a moderate speed, repeat the process until the foam rise covers the voids.
- G. OBIC 1000 (or approved equal) Aromatic Polyurea (Armor Layer) - apply in a single monolithic layer to a nominal dry film thickness of 50 mils using a high-pressure plural component Graco Reactor or a similar plural spray reactor with a pressure of 2000 to 2500 psi. OBIC Aromatic Polyurea dries to tack-free in minutes. Visual inspection and high voltage testing can be performed at the convenience of the client's inspector.

2.3 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 ACCEPTABLE APPLICATORS

- A. Chemical grout applicators should be trained in the proper application and use of chemical grouts and all related equipment;
- B. Repair mortar applicators should be trained to properly apply the cementitious mortar according to manufacturer's recommendations.
- C. Protective coating must be applied by a Certified Applicator of the protective coating manufacturer and according to manufacturer specifications.

3.2 EXAMINATION

- A. All structures to be coated shall be readily accessible to Applicator.
- B. Appropriate actions shall be taken to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety.
- C. Prior to the application of any concrete rehabilitative or protective coating, all infiltration must be permanently stopped by whatever means are necessary as described above. This may include the use of hydraulic cement, chemical injection grouts or other method.
- D. Any active wastewater flows shall be dammed, plugged or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated. If required, flows will be totally plugged and/or diverted when coating the invert. All flows into the manhole or vaults at or above the area coated shall be plugged and/or diverted for the amount of time specified by the manufacturer or until the epoxy has set hard to the touch, whichever is

less. As an option, hot air may be added to the manhole to accelerate set time of the coating.

- E. The Contractor shall assume that structures which may be included in this project are part of the active Owner's wastewater collection system. These structures must remain in operation continuously. However, flow may be stopped by the use of appropriately size inflatable or screw-operated plugs if this can be done intermittently or during periods of low flow. Also, the flow may be diverted through these structures by the installation of appropriate extension pipes or similar fixtures. It shall be the Contractor's responsibility to properly execute and schedule his work to permit the required rehabilitation and the proper application of the manhole coating to be achieved under the existing operating conditions of the Owner's system. Any bypass pumping or other measures which may be required will be the responsibility of the Contractor at no additional compensation. Refer to SECTION 14 of this document for bypass pumping requirements.
- F. Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with the specifications of the protective coating and the substrate coating manufacturers.
- G. Temperature of the surface to be coated should be maintained between 40 deg F and 120 deg F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the temperature is falling versus rising (ie. late afternoon into evening vs. morning into afternoon).

3.3 SURFACE PREPARATION

- A. Applicator shall inspect all surfaces specified to receive a protective coating prior to surface preparation. Applicator shall notify Owner of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair mortar and protective coating.
- B. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface.
- C. All contaminants including oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
- D. Conduct surface preparation program to include monitoring of atmosphere for hydrogen sulfide, methane, low oxygen or other gases, approved flow control equipment and surface preparation equipment.
- E. Surface preparation method(s) should be based upon the conditions of the substrate, service environment and the requirements of the protective coating to be applied.
- F. All surfaces shall be repaired as required by the protective coating system in the intended service condition.

- G. After the defects in the structure are identified, repair all leaks with a chemical or hydraulic sealant designed for use in field sealing of ground water. Severe cracks shall be “repaired with a urethane-based chemical” sealant. Product to be utilized shall be as approved by owner/engineer prior to installation. Repairs to exposed rebar, defective pipe penetrations or inverts, etc. shall be repaired utilizing non-shrink grout or approved alternative method.
- H. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate.
1. Generally, this can be achieved with a high-pressure water cleaning using equipment capable of 3,000 psi at 4 gpm. Other methods such as high-pressure water jetting (refer to NACE Standard No. 5/SSPCSP12), abrasive blasting, shotblasting, grinding, scarifying or acid etching may also be used.
 2. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface that is not excessively damaged.
 3. Debris resulting from surface preparation and cleaning shall be removed from the structure and not allowed to enter the wastewater flow.
 4. Infiltration shall be stopped by using a material which is compatible with the specified repair mortar and is suitable for top coating with the specified protective coating.
 5. It is the contractor’s responsibility to test prepared surfaces after cleaning, but prior to application of the epoxy coating, to determine if a specific pH or moisture content of the concrete has been achieved if this is required according to manufacturer’s recommendations.
 6. The area between the manhole and the manhole ring and any other area that might exhibit movement or cracking due to expansion and contraction, shall be grouted with a flexible or elastomeric grout or gel.

3.4 APPLICATION OF REPAIR MATERIALS

- A. Areas where structural steel, ladders, brackets or piping has been exposed (particularly wet well riser piping) shall be prepared in accordance with the manufacturer’s instructions for the preparation of steel surfaces to receive the protective coating which will be applied to the concrete structure surfaces. All metal surface preparation, primer application, etc. required shall be performed at no additional compensation.
- B. Certain steel structures which are no longer used (ladders, brackets, etc.), shall be removed and discarded by the Contractor provided any resulting holes are filled flush with the concrete surface using the rehab methods described above. The Contractor shall be responsible for disposal of all materials so removed and for the repair of any subsequent damage which may occur during or as a result of such removal. Any such work will be performed at no additional compensation.

- C. Repair materials shall meet the specifications herein. The materials shall be trowel or spray applied utilizing proper equipment on to specified surfaces. The material thicknesses shall be as follows:
1. Concrete build-back material shall be of sufficient thickness to restore the structure to the original thickness, grade and contour.
 2. Protective coating shall be applied to the thickness specified in the particular manufacturer's procedures.
 3. If using approved cementitious repair materials, such shall be trowelled to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No bugholes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.
 4. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.
 5. After abrasive blast and leak repair is performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast, shotblast or other approved method. If repair materials are used, refer to these specifications for surface preparation. Areas to be coated must also be prepared in accordance with these specifications after receiving a cementitious repair mortar and prior to application of the protective coating.

3.5 APPLICATION OF PROTECTIVE COATING

- A. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.
- B. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials at the temperature specified by the manufacturer and shall be regularly maintained and in proper working order.
- C. The protective coating material must be spray applied by a Certified Applicator of the protective coating manufacturer.
- D. Airless spray application equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating to avoid any potential contamination from compressed air oil which may encourage intercoat delamination. Air assisted spray application equipment may be acceptable, especially for thinner coats (<10 mils), only if the air source is filtered to completely remove all oil and water.
- E. If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than 24 hours after the prior coat has been applied at unless additional prior coat surface

preparation is performed. The protective coating manufacturer must be consulted for any additional-coat surface preparation guidelines if necessary.

- F. Depending on wastewater flow levels and how long flow can be stopped, inverts may be lined with an approved 100% solids, fast setting epoxy coating, grout or cementitious material. This treatment is only approved for those surfaces which, after resumption of normal flows, will be constantly covered by a layer of flowing water. Every effort should be made to coat the entire invert with a continuous application of the approved protective coating.
- G. Application procedures shall conform to recommendations of the manufacturer, including materials handling, mixing, environmental controls during application, safety and spray equipment.
- H. Spray equipment shall be specifically designed to accurately ratio and apply the liner system.
- I. Application of multi-layer/component liner system shall be in strict accordance with manufacturer's recommendation. **Final installation shall be a minimum of 1/2" (500 mils).**

3.6 TESTING AND INSPECTION

- A. During application, a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. (or equal) meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used by the Applicator to ensure a monolithic coating and uniform thickness during application. All results, will be verified by the Engineering Field Technician (EFT) in the field. Results shall be submitted to the EFT within 24 hours of testing.
- B. After the protective coating has set hard to the touch it shall be inspected with high voltage holiday detection equipment. An induced holiday shall be made on to the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 40 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations.
- C. A final visual inspection shall be made by the Inspector and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Contractor.
- D. Final liner system shall be completely free of pinholes or voids. Liner thickness shall be the minimum value as described herein.
- E. Visual inspection shall be made by the Owner/Engineer. Any deficiencies in the finished liner system shall be marked and repaired according to the procedures set forth by Manufacturer.

- F. The sewer system may be returned to full operational service as soon as the final inspection has taken place.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide chain link fence system where shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data, submit:
 - 1. Materials list of items proposed to be provided under this section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and sizes of all components.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 DIMENSIONAL DATA

- A. Pipe sizes indicated are commercial pipe sizes.

2.2 GALVANIZING

- A. On steel framework and appurtenances, provide galvanized finish with not less than the following weight of zinc per sq.ft.: Pipe: 1.8 oz. complying with ASTM A53.
 - 1. Hardware and accessories: Comply with Table I of ASTM A153.
 - 2. Fabric: 2.0 oz. complying with Class II of ASTM A392, hot dipped galvanized after weaving.

3. Barbed Wire:
 - a. Wire: 0.80 ounce per square foot.
 - b. Barbs: 0.65 ounce per square foot.
4. Tension wire: 1.2 ounce per square foot.

2.3 ALUMINUM COATING

- A. Fabric: Provide aluminum coated steel in accordance with A491, 0.40 ounce per square foot.
 1. After weaving, coat the cut ends of the wire with a clear, acrylic lacquer to retard corrosion.
- B. Barbed Wire: Provide aluminum coated steel in accordance with A585.
- C. Tension Wire: Provide aluminum coated steel in accordance with A824, Type 1, 0.40 ounce per square foot.

2.4 FABRIC

- A. Provide No. 9 gauge or 0.149-inch wires in 2-inch mesh, with top and bottom selvages twisted and barbed.
- B. Provide fabric in one-piece width of 72 inches.

2.5 BARBED WIRE AND EXTENSION ARMS

- A. Type: Provide one of the following:
 1. Three strands of twisted 12 gauge steel wire with 4 point barbs on 5" centers.
- B. Extension Arms:
 1. Provide pressed steel arms, complete with provisions for anchorage to all posts, with Class 3 zinc coating complying with ASTM A-153.
 2. Designed for attaching 3 rows of barbed wire to each arm.
 3. Capable of withstanding, without failure, a 250 lbs. downward pull at outer most end of arm.

2.6 POSTS, RAILS AND ASSOCIATED ITEMS

- A. Line Posts: Provide 2.375" O.D. pipe, weighing 3.65 lbs. per linear foot.
- B. End, Corner, Slope and Pull Posts: Provide 2.875" O.D. pipe, weighing 5.79 lbs. per linear foot.
- C. Gate Posts:

1. Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
 - a. Up to 6' wide: Use 2.875" O.D. pipe weighing 5.79 lbs. per linear foot.
 - b. Over 6' wide and up to 13': Use 4" O.D. pipe weighing 9.10 lbs. per linear foot.
 - c. Over 13' wide and up to 18' wide: Use 6.625" outside diameter pipe weighing 18.97 lbs. per linear foot.
 - d. Over 18' wide: Use 8.625" outside diameter pipe weighing 28.55 lbs. per linear foot.
 2. Provide dual gate posts for supporting cantilever gates for nominal gate widths as follows:
 - a. Up to 20' wide: Use 4" O.D. pipe weighing 9.10 lbs. per linear foot.
 - b. Over 20' wide: Use 6.625" outside diameter pipe weighing 18.97 lbs. per linear foot.
- D. Top Rails:
1. Use 1.66" O.D. pipe weighing 2.27 lbs. per linear foot.
 2. Provide in manufacturer's longest lengths, with expansion type couplings approximately 6" long for each joint.
 3. Provide means for attaching top rail securely to each gate, corner, pull, slope and end post.
- E. Post Brace Assemblies:
1. Provide at end and gate posts, and at both sides of corner, slope, and pull posts, with the horizontal brace located at mid-height of the fabric.
 2. Use 1.66" outside diameter pipe weighing 2.27 lbs. per linear foot for horizontal brace.
 3. Use $\frac{3}{8}$ " diameter rod with turnbuckle for diagonal truss.
- F. Post Tops:
1. Provide wrought iron or malleable iron, designed as weather tight closure cap.
 2. Provide one cap for each post.
 3. Provide caps with openings to permit through passage of top rail.
- G. Stretcher Bars:

1. Provide one piece lengths equal to full height of fabric, with a minimum cross section of 3/16" x 3/4".
2. Provide one stretcher bar for each gate and end post, and two for each corner, slope, and pull post, except where fabric is woven integrally into the post.

H. Stretcher Bar Bands:

1. Provide wrought iron or malleable iron, spaced not over 15" on centers, to secure stretcher bars to end, corner, pull, slope, and gate posts.
2. Bands may be used also with special fittings for securing rails to end, corner, pull, slope and gate posts.

I. Truss Rod Bends:

1. Provide wrought iron or malleable iron to secure truss rod to end, corner, pull, slope, and gate posts.

2.7 SWING GATES

A. General:

1. Fabricate gate perimeter frames of tubular members.
2. Provide additional horizontal and vertical members to assure proper operation of the gate, and for attachment of fabric, hardware and accessories.
3. Space so frame members are not more than 6' apart.
4. Fabricate gate frames from pipe 1.90" O.D. weighing 2.72 lbs. per linear foot.

B. Fabrication:

1. Assemble gate frames by welding, with special malleable or pressed steel fittings and rivets for rigid connections.
2. Use same fabric as used in the fence.
3. Install fabric with stretcher bars at vertical edges as a minimum.
4. Attach stretchers to gate frame at not more than 15" on centers.
5. Attach hardware with rivets or by other means which will provide security against removal and breakage.
6. Provide diagonal cross bracing consisting of 3/8" diameter adjustable length truss rods on gates where required to provide frame rigidity without sag or twist.

C. Gate Hardware: Provide following for each gate:

1. Hinges:

- a. Pressed or forged steel, or malleable iron, to suit the gate size; non-lift-off type, offset to permit 180° opening.
- b. Provide 1 pair of hinges for each leaf over 6' in nominal height.
2. Latches:
 - a. Provide forked type or plunger bar type to permit operation from either side of the gate.
 - b. Provide padlock eye as integral part of latch.
3. Keeper: Provide keeper for vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released.
4. Double Gates:
 - a. Provide gate stops for double gates consisting of mushroom or flush plate, with anchors.
 - b. Set in concrete to engage the center drop rod or plunger bar.
 - c. Provide locking device and padlock eyes as an integral part of the latch, requiring one padlock for locking both gate leaves.
5. All gate hardware to be hot dipped galvanized.

2.8 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Wire Ties:
 1. For tying fabric to line posts, use No. 6 gauge aluminum alloy wire ties spaced 12" on centers.
 2. For tying fabric to rails and braces, use No. 6 gauge aluminum alloy wire ties spaced 24" on centers.
 3. For tying fabric to tension wire, use No. 11 gauge aluminum alloy hog rings spaced 24" on centers.
 4. Manufacturer's standard wire ties will be acceptable if of equal strength and durability.
- B. Concrete: Comply with provisions of Section 03300 for 2500 psi concrete.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct additions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:

1. Install posts at a maximum spacing of 10' on centers.
2. Install corner or slope posts where changes in line or grade exceed a 30° deflection.

B. Excavating:

1. Drill holes for post footings in firm, undisturbed or compacted soil, strictly adhering to the dimensions and spacing shown.
2. Spread soil from excavations uniformly adjacent to the fence line, or on adjacent areas of the site if so directed.
3. When solid rock is encountered near the surface, drill into rock at least 12" for line posts and at least 18" for end, pull, gate and corner posts. Drill hole at least 1" greater diameter than the largest dimension of the post to be placed.
4. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed minimum depths specified above.

C. Setting Posts:

1. Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
2. Center and align posts in holes.
3. Place concrete around posts in a continuous pour, and vibrate or tamp for consolidation.
4. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
5. Trowel tops of footings, and slope or dome to direct water away from posts.
6. Extend footings for gate posts to the underside of bottom hinge.
7. Set keeps, stops, sleeves and other accessories into concrete as required.
8. Keep exposed concrete surfaces moist for at least 7 days after placement, or cure with membrane curing material or other curing method approved by the Engineer.
9. Grout in those posts which are set into sleeved holes, concrete constructions, or rock excavations, using non-shrink Portland cement grout or other grouting material approved by the Engineer.

D. Concrete Strength:

1. Allow concrete to attain at least 75% of its minimum 28 day strength before rails, tension wires, and/or fabric is installed.
2. Do not, in any case, install such items in less than 7 days after placement of concrete.
3. Do not stretch and tension fabric and wire, and do not hang gates until concrete has attained its full design strength.

E. Rails and Bracing:

1. Install fence with a top rail and bottom tension wire.
2. Install top rails continuously through post caps or extension arms, bending to radius for curved runs.
3. Provide expansion couplings as recommended by the fencing manufacturer.
4. Provide bracing to the mid point of the nearest line post or posts at all end, corner, slope, pull and gate posts.
5. Install tension wires parallel to the line of fabric by weaving through the fabric, and tying to each post with not less than No. 6 gauge galvanized wire, or by securing the wire to the fabric.

F. Installing Fabric:

1. Leave approximately 2" between finish grade and bottom selvage.
2. Excavate high points in the ground to clear the bottom of the fence.
3. Place and compact fill to within 1" of the bottom of the fabric in depressions.
4. Pull fabric taut and tie to posts, rails and tension wires.
5. Install fabric on outward side facing side of fence, and anchor to framework so that the fabric remains in tension after pulling force is removed.
6. Install stretcher bars by threading through or clamping to fabric on 4" centers, and secure to posts with metal bands spaced 15" on centers.

- G. Installing Barbed Wire:
 - 1. Install three (3) parallel wires on each extension arm, on security side of fence, pull wire taut and secure in place.

- H. Installing Gates:
 - 1. Install gates plumb, level, and secure for full opening without interference.
 - 2. Install ground set items in concrete for anchorage in accordance with the fence manufacturer's recommendations as approved by the Engineer.
 - 3. Adjust rollers and guides of sliding gates so that gates are level.
 - 4. Lubricate and adjust the hardware for smooth operation.

- I. Miscellaneous:
 - 1. Use U-shaped tie wires, conforming to diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted at least two full turns.
 - 2. Bends ends of wire to minimize hazards to persons and clothing.
 - 3. Fasteners:
 - a. Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
 - b. Peen the ends of bolts to prevent removal of nuts.
 - 4. Repair coatings damaged in the shop or field erection, using a hot applied repair compound applied in accordance with its manufacturer's recommendations as approved by the Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide grassing of the areas specified herein, or as indicated, for a complete and proper installation.
 - 1. Sanitary Sewer Easements, including highway and street shoulders: All areas disturbed by the construction operation.
- B. Related Work:
 - 1. Section 02900 – Landscape Work
 - 2. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Seed: Conform to all State laws and to all requirements and regulations of the South Carolina Department of Agriculture.
 - 1. Deliver to site each variety of seed individually packaged and tagged to show name, net weight, origin and lot number.
- C. Fertilizer: Conform to State fertilizer law.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.
- B. At time of delivery, furnish the Engineer invoices of all materials received in order that application rates may be determined.
- C. Immediately remove from the site materials that do not comply with the specified requirements, and promptly replace with materials meeting the specified requirements.

PART 2 - PRODUCTS

2.1 FERTILIZER

- A. Provide a mixed fertilizer with a designation such as 10-10-10, where the first number represents the minimum percent of nitrogen required, the second number represents the minimum percent of available phosphoric acid required, and the third number represents the minimum percent of water soluble potash required in the fertilizer. For centipede grass, use only 15-0-15 or 16-4-8 fertilizer. Fertilizer shall be delivered to the site in bags labeled with the manufacturer's guaranteed analysis.

2.2 GRASS SEED

- A. Provide grass seed which is:
1. Free from noxious weed seeds, and recleaned.
 2. Grade A recent crop seed.
 3. Treated with appropriate fungicide at time of mixing.
 4. Delivered to the site in sealed containers with dealer's guaranteed analysis.

2.3 LIME

- A. Provide agricultural grade, standard ground limestone conforming to current "Rules, Regulations and Standards of the Fertilizer Board of Control" issued at Clemson University.
- B. Bag tags or delivery slip for bulk loads shall indicate brand or trade name, calcium carbonate equivalent, and other pertinent data to identify the lime.

2.4 WOOD CELLULOSE FIBER

- A. Provide wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer.
- B. Material to be heat processed so as to contain no germination or growth inhibiting factors.
- C. It shall be dyed (non-toxic) an appropriate color to facilitate metering.

2.5 STRAW MULCH

- A. Provide straw or hay material.
1. Straw to be stalks of wheat, rye, barley or oats.
 2. Hay to be timothy, peavine, alfalfa, or coastal Bermuda.
- B. Material to be reasonably dry and reasonably free from mature seed bearing stalks, roots or bulblets or Johnson Grass, Nutgrass, Wild Onion, Sandburg, Wild Garlic, Wild Mustard, Crotalaria, Pigweed, Witchweed, and Cocklebur and other noxious weeds.

2.6 EXCELSIOR FIBER MULCH

- A. To consist of 4" to 6", average length, wood fibers cut from sound, green timber.
- B. Make cut in such a manner as to provide maximum strength of fiber, but at a slight angle to natural grain of the wood.

2.7 EROSION CONTROL BLANKET

- A. Provide on areas as shown on the plans.
- B. Provide Erosion Control Blanket S150, from North American Green, or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Seed these areas immediately upon completion of grading or construction and clean-up operations.
 - 1. Slopes greater than four horizontal to one vertical.
 - 2. Utility rights-of-way adjacent to stream banks.

3.2 SEEDING SCHEDULES

- A. Unless otherwise provided, select the type of seeding from the tables shown below for the upper state and the lower state regions as applicable to the project. The total seed rate in pounds per acre is the sum total shown for all the varieties of seed opposite the schedule number in the seeding schedules included herein. The upper state region consists of all counties west of the counties of Aiken, Lexington, Richland, Kershaw, and Chesterfield. The lower state region consists of the above-cited counties and all counties east.

B. Adhere to the following seeding schedules:

Seeding Schedule for Permanent Vegetation Upper State				
Schedule No.	Common Name of Seed	Pounds/acre Rural ¹	Pounds/acre Urban ¹	Planting Dates
1	Common Bermuda (hulled) ³	23	23	March 15 to August 14
	Sericea Lespedeza (scarified) ²	50	50	
	Kentucky 31 Fescue	50	60	
	Weeping Lovegrass ²	10	10	
2	Kentucky 31 Fescue	50	80	August 15 to March 14
	Sericea Lespedeza (unhulled, unscarified) ²	80	80	
	Common Bermuda (unhulled) ³	30	30	
	Weeping Lovegrass ²	10	10	
	Reseeding Crimson Clover ⁴	20	0	
	Annual Rye Grass ⁵	5	15	
	Rye Grain	20	0	

Notes:

¹ Includes rural areas adjacent to well-developed lawns.

² Not required on shoulders, medians, etc. and on slopes under 5 feet in height.

³ Do not use Giant Bermuda seed including NK-37.

⁴ Provide an inoculant for treating reseeding crimson clover seed of a pure culture of nitrogen-fixing bacteria selected for a maximum vitality and ability to transform nitrogen from the air into soluble nitrates and deposit them into the soil. Ensure that inoculants consist of purebred cultures and are not more

than one year old. Do not plant clover in medians or in rural areas adjacent to well-developed lawns.

⁵ The use of Italian Rye Grass is prohibited on all projects.

Seeding Schedule for Permanent Vegetation Lower State				
Schedule No.	Common Name of Seed	Pounds/acre Rural ¹	Pounds/acre Urban ¹	Planting Dates
3 ⁵	Common Bermuda (hulled) ³	30	30	March 1 to August 14
	Weeping Lovegrass ²	10	10	
	Sericea Lespedeza (scarified) ²	50	50	
	Weeping Lovegrass ²	10	10	
4 ⁵	Common Bermuda (unhulled) ³	40	40	August 15 to February 28
	Weeping Lovegrass ²	10	10	
	Sericea Lespedeza (unhulled, unscarified) ²	80	80	
	Reseeding Crimson Clover ⁴	20	0	
	Annual Rye Grass ⁵	5	15	
	Rye Grain	20	0	
5 ⁶	Centipede	10	10	March 1 to April 15

Notes:

¹ Includes rural areas adjacent to well-developed lawns.

² Not required on shoulders, medians, etc. and on slopes under 5 feet in height.

³ Do not use Giant Bermuda seed including NK-37.

⁴ Provide an inoculant for treating reseeded crimson clover seed of a pure culture of nitrogen-fixing bacteria selected for a maximum vitality and ability to transform nitrogen from the air into soluble nitrates and deposit them into the soil. Ensure that inoculants consist of purebred cultures and are not more

than one year old. Do not plant clover in medians or in rural areas adjacent to well-developed lawns.

⁵ Pensacola Bahia is allowed only as shown in Seeding Schedules 3 and 4 at the rate of 50 pounds per acre only when seeding pit areas that are governed by the South Carolina Mining Act. Otherwise, do not include Bahia seed in the mix.

⁶ Apply one-half of lime rates and one-half of maintenance fertilizer rates. Fertilize centipede at the application rate of 20 pounds per acre of 16-4-8 or 15-0-15 fertilizers in May and repeat in August.

⁷ The use of Italian Rye Grass is prohibited.

- C. The Contractor may include quantities of rye grain and millet in Schedule Nos. 1 and 3 to establish quick ground cover for erosion control purposes.

Seeding Schedule for Temporary Vegetation Upper and Lower State			
Schedule No.	Common Name of Seed	Pounds/acre	Planting Dates
1	Brown Top Millet	50	April 1 to August 15
2	Rye Grain	55	August 16 to March 31
	Annual Rye Grass ¹	15	
¹ The use of Italian Rye Grass is prohibited.			

3.3 GROUND PREPARATION

- A. Bring all areas to proper line, grade and cross section indicated on the plans.
- B. Repair erosion damage prior to commencing seeding operations.
- C. Loosen seedbed to minimum depth of 3".
- D. Remove all roots, clods, stones larger than 1" in any dimension, and other debris.
- E. Provide and prepare topsoil in accordance with Section 02310.
- F. Conduct soil test to determine pH factor.
 - 1. If pH is not in the range of 6.0 to 6.5, adjust.

3.4 APPLICATION OF FERTILIZER

- A. Spread uniformly over areas to be seeded at:
 - 1. Rate of 1000 lbs. per acre.
 - 2. Fertilize centipede at the application rate of 20 pounds per acre of 16-4-8 or 15-0-15.
 - 3. Use approved mechanical spreaders.
- B. Mix with soil to depth of approximately 3".

3.5 SOWING METHODS

- A. General:

1. Perform seeding during the periods and at the rates specified in the seeding schedules.
 2. Do not conduct seeding work when ground is frozen or excessively wet.
 3. Produce satisfactory stand of grass regardless of period of the year the work is performed.
- B. Seeding, slopes less than four horizontal to one vertical:
1. Shall conform to Methods EA, WF or WCF as specified hereinafter.
 2. Method EA (Emulsified Asphalt):
 - a. Sow seed not more than 24 hours after application of fertilizer.
 - b. Use mechanical seed drills on accessible areas, rotary hand seeders, power sprayers, etc. may be used on steep slopes or areas not accessible to seed drills.
 - c. Cover seed and lightly compact with cultipacker if seed drill does not.
 - d. Within 24 hours following compaction of seeded areas, uniformly apply 0.2 gallons per square yard of emulsified asphalt over the seeded area.
 3. Method WF
 - a. Sow seed as specified for Method EA.
 - b. Within 24 hours following covering of seeds, uniformly apply excelsior fiber at the rate of 100 lbs. per 1000 sq.ft.
 - c. Apply material hydraulically.
 - d. Seeded areas to be lightly rolled to form a tight mat of the excelsior fibers.
 4. Method WCF
 - a. Apply seed, fertilizer and wood fiber mulch using hydraulic equipment.
 - b. Equipment to have built-in agitation system with capacity to agitate, suspend and homogenously mix a slurry of the specified amount of fiber, fertilizer, seed and water.
 - c. Minimum capacity of slurry tank: 1000 gallons.
 - d. Apply fiber mulch at rate of 35 lbs. per 1000 sq.ft.
 - e. Regulate slurry mixture so that amounts and rates of application will result in uniform application of all materials at not less than the specified amounts.

- f. Apply slurry in a sweeping motion, in an arched stream, so as to fall like rain, allowing the wood fibers to build upon each other.
 - g. Use color of wood pulp as guide, spraying the prepared seedbed until a uniform visible coat is obtained.
- C.
 - 1. Seeding (slopes greater than four horizontal to one vertical)
 - 2. Sow seed as specified for Method EA, unmulched.
 - 3. Cover seeded area with erosion control blanket.

3.6 SECOND APPLICATION OF FERTILIZER

- A. When plants are established and showing satisfactory growth, apply nitrogen at the rate of 1.0 lb. per 1000 sq.ft.
- B. Apply in dry form unless otherwise directed by the Engineer.
- C. Do not apply to stands of temporary grasses.

3.7 MAINTENANCE

- A. Maintain all seeded areas in satisfactory condition until final acceptance of the work.
- B. Areas not showing satisfactory evidence of germination within six weeks of the seeding date shall be immediately reseeded, fertilized and/or mulched.
- C. Repair any eroded areas.
- D. Mow as necessary to maintain healthy growth rate until final acceptance of the work.

3.8 ACCEPTANCE

- A. Permanently seeded areas will be accepted when the grass attains a height of 2".
- B. No acceptance will be made of temporary seeded areas. Rework and seed per Permanent Seeding Schedule.

3.9 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Under this item, the Contractor is required to furnish all materials, labor, equipment, power, and maintenance, etc. to implement a temporary pumping system for the purpose of diverting the existing flow around the work area.
- B. The design, installation, and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction over the project.

1.2 RELATED SECTIONS

- A. Section 01060 – Regulatory Requirements
- B. Section 01340 – Shop Drawings, Product Data & Samples
- C. Section 02530 – Sanitary Sewerage Collection

1.3 SUBMITTALS

- A. Submittals shall be made within 30 days prior to beginning temporary bypass pumping.
- B. Submit the following in accordance with the conditions of the Contract Documents and Section 01300 - Submittals of these specifications:
 - 1. Drawings:
 - a. Schematic design of temporary bypass pumping system
 - b. Proposed bypass pumping schedule

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with utility owner standards and the conditions of the permit to construct improvements.

1.5 EXPERIENCE

- A. The Contractor shall have a company history of supporting these types of functions including the proper training in these types of materials, equipment and activities associated with temporary bypass pumping.

1.6 CONFINED SPACE

- A. Comply with federal, state, and local standards for the entering of confined spaces.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All pumps used shall be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.
- B. The Contractor shall provide the necessary controls for each pump.
- C. It is recommended that the pump be contained inside a temporary portable berm to contain any fuel or sewage that may spill during the normal course of operation.

PART 3 - EXECUTION

3.1 SYSTEM DESCRIPTION

- A. General:

At the Preconstruction Conference or before the start of construction, submit in writing to the Owner's representative a description/schematic and schedule of the proposed bypass pumping system.

- B. Design Requirements

- 1. Bypass pumping systems shall have sufficient capacity to pump peak flow regardless of prevailing weather conditions or time of day. Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be repaired. Bypass pumping systems will be required to be operated 24 hours per day.
- 2. Bypass pumps shall be sized for 350 GPM at 163 feet of head to match the proposed submersible pumps to be installed at the lift station.
- 3. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow by passing locations, ready for use in the event of primary pump failure.
- 4. Bypass pumping system shall be capable of bypassing the flow around the work area and be sized to handle any amount of flow up to full available flow as defined by the customer into the work area as necessary for satisfactory performances of work.
- 5. The Contractor shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System must overcome any existence force main pressure on discharge.

C. Performance Requirements

1. It is essential to the operation of the existing system being bypassed that no interruptions in the flow occur throughout the duration of the project. To this end, the Contractor shall provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the incoming flow before it reaches the point where it would interfere with his work, carry it past the work area and return it to the existing system downstream of his work.
2. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
3. The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances.
4. The Contractor shall divert the flow around the work area in manner that will not cause damage to, or surcharging of customers system and will protect public and private property from damage and flooding.
5. The Contractor shall protect water resources, wetlands, and other natural resources.

3.2 NOISE CONTROL FOR EACH PUMP AND/OR GENERATOR

- A. The noise resulting from operation of the pump and/or generator shall be muffled to ensure minimum disruption and annoyance to others.

3.3 PRE TEST OF BYPASS PUMPING

- A. A pretest of the bypass pumping system shall be conducted for a period of 24 hours prior to implementing the bypass system as an element of construction activities.

3.4 OWNER AND ENGINEER TO BE HELD HARMLESS

- A. The Contractor shall hold harmless the Owner, the Engineer, and the authority having jurisdiction over the work in any legal action resulting from sewage back-up, release, or spill.

3.5 FIELD QUALITY CONTROL AND MAINTENANCE

- A. Test:
1. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to the actual operation. The Owner's representative will be given 24 hours' notice prior to testing.

- B. Inspection:
1. Contractor shall inspect bypass pumping system on a continuous basis to ensure the system is working correctly.
- C. Maintenance Service:
1. Contractor shall ensure the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

END OF SECTION

DIVISION 3

CONCRETE

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide cast-in-place concrete, including formwork and reinforcement, where shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Reference Standards: Comply with the following codes, specifications and standards, except as otherwise shown or specified:
 - 1. American Concrete Institute (ACI) Publications:
 - a. ACI 301 Specification for Structural Concrete for Buildings
 - b. ACI 305 Recommended Practice for Hot Weather Concreting
 - c. ACI 306 Recommended Practice for Cold Weather Concreting
 - d. ACI 315 Manual of Standard Practice for Detailing Reinforced Concrete Structures
 - e. ACI 318 Building Code Requirements for Reinforced Concrete
 - f. ACI 347 Recommended Practice for Concrete Framework
 - 2. American Society for Testing and Materials (ASTM) Publications:
 - a. A185 Welded Steel Wire Fabric for Concrete Reinforcement
 - b. A615 Deformed and Plain Billet Steel Bars for Concrete Reinforcement
 - c. C31 Making and Curing Concrete Test Specimens in the Field
 - d. C33 Concrete Aggregates
 - e. C39 Compressive Strength of Cylindrical Concrete Specimens
 - f. C94 Ready-Mixed Concrete

- g. C150 Portland Cement
- h. C260 Air-Entraining Admixtures for Concrete
- 3. Concrete Reinforcing Steel Institute (CRSI):
 - a. "Manual of Standard Practice"
- 4. American Welding Society (AWS) Publication
 - a. D12.1-61 Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete
- C. Testing Agency: A testing laboratory will be retained by the Owner to perform material evaluation tests required by these specifications.
- D. Qualifications of contractors performing concrete work: Minimum of two (2) years experience on comparable concrete projects.
- E. Plant Qualification: Plant equipment and facilities shall meet all requirements of the Check List for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C94.

1.3 SUBMITTALS

- A. Comply with the pertinent provisions of Section 01340.
- B. Proportions of proposed mix shall be determined by means of laboratory tests of concrete made with the cement and aggregate proposed for use.
- C. Provide report in detail from an approved testing laboratory showing 7-day and 28-day strengths obtained using materials proposed.
- D. Required average strength above specified strength:
 - 1. Determinations of required average strength above specified strength ($f'c$) shall be in accordance with ACI 318 and ACI 301.
 - 2. Establish the required average strength of the design mix using the materials proposed to be employed. Standard deviations shall be determined by thirty tests. Average strength used for selecting proportions shall exceed specified strength ($f'c$) by at least:

400 psi	Standard deviation is less than 300
550 psi	Standard deviation is 300 to 400
700 psi	Standard deviation is 400 to 500
900 psi	Standard deviation is 500 to 600
1200 psi	Standard deviation is above 600 or unknown
 - 3. When the ready-mix producer does not have a record of past performance, the combination of materials and the proportions selected shall be selected from trial

mixes having proportions and consistencies suitable for the work using at least three (3) different water/cement ratios which will produce a range of strengths encompassing those required. Average strength required shall be 1200 psi above specified strength.

4. Cost of this work shall be borne by the Contractor.
- E. **Manufacturer's Data:** Submit manufacturer's specification with application instructions for proprietary materials and items, including curing compound, form release agents, admixtures, patching compounds, and others as required by the Engineer.
- F. **Shop drawings:** Submit the following shop drawings to the Engineer for approval before work is started.
 1. **Reinforcing Steel Drawings:** Prepare in accordance with ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, dimensions and details of bar reinforcing and accessories.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.
- B. Store reinforcement in a manner that will avoid excessive rusting or coating by grease, oil, dirt and other objectionable materials.
- C. Keep reinforcement in separate piles or racks so as to avoid loss of identification after bundles are broken.

PART 2 - PRODUCTS

2.1 FORMS

- A. Use form materials conforming to ACI 347.
- B. **Form Lumber:** Use lumber of sufficient quality and grade, size and stiffness to adequately support the work and insure dimensional accuracy.
- C. **Form Ties:** Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole.
 1. Use ties with cones that allow a 1" break back and facilitate patching.
 2. On structures containing water or other liquid or below grade structures, use embedded rod ties with integral water stops in addition to cones.
 3. Wire ties and wood spreaders will not be permitted.
- D. **Form Coatings:** Form release coating shall be neat oil with surface wetting agent or chemical release agent which effectively prevents absorption of moisture, prevents bonding with concrete, is non-staining to concrete and leaves the concrete with a paintable surface.

1. On surfaces to receive an applied coating, use a residual free chemical form release agent which is compatible with the applied coating and will not prevent the applied finish from satisfactorily bonding to the concrete.
- E. Chamfer Strips: Chamfer strips shall be wood or polyvinyl strips or approved equal, designed to be nailed in the forms to provide a 3/4" chamfer (unless indicated otherwise) at all exposed edges and corners of concrete members.

2.2 REINFORCEMENT

- A. Comply with the following as minimums:
1. Bars: ASTM A615, Grade 60, unless otherwise shown on the drawings, using deformed bars for Number 3 and larger.
 2. Welded Wire Fabric: ASTM A185.
 - a. Use sheet (mat) welded wire fabric only.
 - b. Welded wire fabric supplied in rolls will not be accepted.
 3. Bending: ACI 315 and ACI 318.

Fabricate reinforcement to the required shapes and dimensions, within fabrication tolerances stated in the CRSI "Manual of Standard Practices".

Do not use reinforcement having any of the following defects:

1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances.
2. Bends or kinks not indicated on the drawings or required for this work.
3. Bars with excessive rust, scale, dirt, oil or other defects which will reduce the bond or the effective cross section of the bar.

Furnish all support bars, tie bars, chairs, bolsters, etc. required for properly supporting and spacing bars in the forms.

1. For slabs on grade, use supports with stand plates or horizontal runners where wetted base materials will not support chair legs. Other supports must be approved by the Engineer.
2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are hot-dip galvanized, plastic protected or stainless steel.

3. Supply supports for welded wire fabric as follows:

Welded Wire Reinforcement (diameter)	Welded Wire Spacing (inches)	Maximum Support Spacing (feet)
W9 or larger	12 and greater	4
W5 to W8	12 and greater	3
W9 and larger	Less than 12	3
W4 to W8	Less than 12	2
Less than W4	Less than 12	1.5

Tie Wire: FS QQ-W-461, annealed steel, black, 16 gauge minimum.

Welding Electrodes: AWS A5.1, low hydrogen, E70 series.

Splice Devices: Shall be sized to develop one hundred twenty-five (125%) percent of yield strength of bar.

2.3 CONCRETE MATERIALS

- A. Cement: Use Portland Cement: ASTM C150, Type I, Type I-P or Type II, low alkali.
 - 1. Where concrete will be exposed to sewage, use Type II or I-P cement.
 - 2. Fly ash shall conform to ASTM C618, Class C or F.
 - 3. Fly ash content shall not exceed 20% by weight of the total amount of cementations materials (Portland cement plus fly ash).
- B. Aggregates:
 - 1. Fine Aggregate: Conform to ASTM C33.
 - 2. Coarse Aggregate: Conform to ASTM C33, Size #57.
- C. Water: Clean and potable and free from injurious amounts of deleterious materials.
- D. Admixtures
 - 1. Air entraining admixture: ASTM C260.
 - 2. Water reducing, set controlling admixture: Conform to ASTM C494.
 - a. Type A - water reducing.
 - b. Type D - water reducing and retarding.

3. Superplasticizers: Conform to ASTM C494, Types F and G.
 - a. Use superplasticizers in thin section placements and in areas of congested reinforcing and/or embedded items, or where otherwise approved by the Engineer.
 - b. Use where conventional consolidation techniques are impractical.
 4. Do not use admixtures containing calcium chloride.
- E. Fiber Reinforcing
1. Use fiber reinforcing where indicated on the drawings.
 2. Provide polypropylene or co-polymer fibers as manufactured by High Tech Fibers, Inc., Fibermesh Company or an approved equal.
 3. Where required, use fiber reinforcing at a rate of 2.0 lbs. per cubic yard unless another rate is indicated on the drawings.
- F. Curing Compounds
1. On all vertical and formed surfaces, construction joints, basin slabs, surfaces to receive an applied coating or finish, and other surfaces except as otherwise indicated or specified, use a non-residual, non-staining curing compound conforming to ASTM C309 Type 1 and 1D. Acceptable products are:
 - a. L&M Cure by L&M Construction Chemicals, Inc.
 - b. Horn WB-75 by A.C. Horn Company.
 - c. Sonosil by Sonneborn, Inc.
 - d. Approved equal.
 2. On building floor slabs not otherwise receiving an applied coating or finish and on other flatwork as indicated on the Drawings, provide an acrylic copolymer curing and sealing compound conforming to ASTM C309 Type 1 and the following:
 - a. Non-yellowing.
 - b. Minimum 20% solids.
 - c. Maximum unit moisture loss in accordance with ASTM C156 - 0.40 kg./sq.m at 72 hours.
 - d. Acceptable products are Dress & Seal by L&M Construction Chemicals, Inc., Clear Seal Standard by A. C. Horn Company, Kure-N-Seal 0800 by Sonneborn, Inc., or approved equal.

2.4 CONCRETE MIXES

- A. Provide concrete with the compressive strengths shown on the drawings. When such strengths are not shown on the drawings, provide the following 28-day strengths as minimum:

All structural concrete except as indicated in Nos. 2 and 3 below:	4000 psi
All sidewalks, curbs and gutters, and unreinforced foundations:	3000 psi
Thrust blocking, backfill or encasement for piping, and concrete fill:	2500 psi
Prestressed or precast concrete:	5000 psi

- B. Maximum Water Cement Ratios

4000 psi concrete	0.5
3000 psi concrete	0.53
2500 psi concrete	0.67

- C. Entrained Air

3000 and 4000 psi concrete	5% ± 1%
2500 psi concrete	Not Required

- D. Slump

3000 and 4000 psi concrete	4" ± 1"
2500 psi concrete	5" ± 1"

- E. Production of Concrete

1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C94 except as otherwise indicated.
2. Monitor time and mix proportions by plant delivery slips.
3. Air Entraining Admixtures: Add air-entraining admixture into the mixture as a solution and measure by means of an approved mechanical dispensing device.
4. Water reducing and retarding admixture: Add water reducing and retarding admixture and measure as recommended by the manufacturer.
5. Addition of water to the mix upon arrival at the job site shall not exceed that necessary to compensate for a 1" loss in slump, nor shall the design maximum water-cement ratio be exceeded. Water shall not be added to the batch at any later time.
6. Weather Conditions: Control temperature of mix as required by ACI 306 "Cold Weather Concreting" and by ACI 305 "Hot Weather Concreting".

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Water, mud, organic, and other detrimental material shall be removed from excavations before concrete is deposited.
- C. Notify the Engineer prior to placing concrete and place no concrete until the formwork, reinforcing and embedded items have been inspected by the Engineer.

3.2 FORMWORK

- A. General
 - 1. Construct forms in conformance with ACI 347.
 - 2. Design, erect, support, brace and maintain formwork so it will safely support vertical and lateral loads which might be applied until such loads can be supported safely by the concrete structure.
 - 3. Construct forms to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, location, grades, level and plumb work in the finished structure.
 - 4. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and prevent fins.
- B. Form Construction and Erection
 - 1. Construct forms in conformance with ACI 347.
 - 2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts and other embedded items as required.
 - 3. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the Engineer.
 - 4. Unless specifically stated otherwise, provide 3/4" chamfer at all exposed edges of concrete.
 - 5. Provide temporary openings in the formwork where necessary to facilitate cleaning and inspection of the formwork.
 - 6. Coat form contact surfaces with approved form coating compound prior to placing reinforcing steel.

7. Do not allow excess form coating material to accumulate in the forms or to come in contact with reinforcing surfaces which will bond to fresh concrete.
 8. Side forms for footings may be omitted, and concrete may be placed directly against excavation only when requested by the Contractor and approved by the Engineer.
 9. Provide a positive means of adjustment of shores and struts and insure that all settlement is taken up during concrete placing.
 10. Construct blockouts and formed openings of sufficient size and proper location to permit final alignment of items within it or passing through it.
 - a. Allow sufficient space for grouting, packing or sealing around any items penetrating the opening as may be required to ensure watertightness.
 - b. Provide openings with continuous keyways with waterstops where required, and provide a slight flare to facilitate grouting and the escape of entrapped air during grouting.
 - c. Provide only blockouts or openings that are shown on the drawings or otherwise approved by the Engineer.
- C. Formwork Reuse: Reuse only forms that are in good condition and which maintain a uniform surface texture on expose concrete surfaces.
1. Apply a light sanding as necessary to obtain a uniform texture.
 2. Plug unused tie holes and penetrations flush with the form surface.
- D. Removal of Forms
1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
 2. Do not remove forms before the following minimum times without prior approval from the Engineer:
 - a. Sides of footings or slabs on grade 24 hrs
 - b. Walls not supporting load 48 hrs
 - c. Vertical sides of beams 48 hrs
 - d. Columns not supporting load 48 hrs
 - e. Suspended slabs or beam bottoms (forms only) 10 days

3. In determining the minimum stripping times, consider only the cumulative time during which the ambient temperature of the air surrounding the concrete is above 50°.
4. Do not remove shoring for suspended slabs or beams until the concrete has reached 75% of the specified 28-day strength.
5. When reshoring or backshoring is permitted or required, plan the operations in advance and submit procedures to the Engineer for approval.
 - a. Design and plan all reshoring operations to support all construction loading and in accordance with ACI 347.
6. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged and that corners are true, sharp and unbroken.
7. Do not permit steel spreaders, form ties, or other metal to project from or be visible on any concrete surface except where so shown on the drawings.
8. Whenever the formwork is removed during the curing period, continue to cure the exposed concrete by one of the methods specified herein.

3.3 EMBEDDED ITEMS

- A. Embedded Items: Set anchor bolts and other embedded items accurately and securely in position in the forms until the concrete is placed and set.
 1. Use templates where practical for all anchor bolts.
 2. Check locations of all anchor bolt and special castings prior to placing concrete and verify locations after concreting.
- B. Piping Cast in Concrete
 1. Install and secure sleeves, wall pipes and pipe penetrations before placing concrete.
 2. Do not weld or otherwise attach piping to reinforcing steel.
 3. Support piping to be encased in concrete securely and on firm foundation so as to prevent movement or settlement during concreting.
- C. Locate electrical conduit so that it will not impair the strength of the construction.
 1. Do not use conduits running within (not passing through) a slab, wall or beam that are larger in outside diameter than 1/2" the overall concrete thickness unless otherwise approved by the Engineer.
 2. Do not space conduits closer than three conduit diameters apart unless otherwise approved by the Engineer.

3.4 REINFORCEMENT

- A. General: Comply with the specified codes and standards and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for details and methods of reinforcement placement and supports and as herein specified.
1. Clean reinforcement and remove loose dust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
 2. Position and secure reinforcement against displacement by forms, construction, and the concrete placement operations.
 3. Use adequate number of ties to secure reinforcing.
 4. Do not weld or field bend reinforcing without prior approval by the Engineer.
- B. Placing Reinforcing
1. Provide and install all chairs, runners, bolsters, standees and other accessories in sufficient quantities to satisfactorily position the reinforcing and hold it in place during concrete placement.
 2. Support reinforcing for slabs on ground on chairs or bolsters with stand plates or a properly sized concrete cube.
 - a. Use concrete bricks as supports only as approved by the Engineer.
 3. Secure and tie dowels in place prior to placing concrete. Do not press dowels into wet concrete.
- C. Concrete Cover: Unless otherwise indicated on the drawings or specified herein, install reinforcing with clear concrete coverage in conformance with ACI 318.
1. All reinforcement, regardless of size, exposed to water or sewage shall have 2" cover.
 2. Place reinforcement a minimum of 2" clear of any openings or metal pipe or fittings.
- D. Splicing Reinforcement: Splice reinforcement steel in accordance with the latest revisions of ACI 318 "Building Code Requirements for Reinforced Concrete" unless shown otherwise on the drawings.
1. All splices at wall corners or intersections and at wall and foundation intersections shall be Class B tension splices.
 2. All other splices of vertical or horizontal steel in walls shall be Class B tension splices as per ACI 318.
 3. Horizontal ring steel in circular, non-prestressed concrete tanks shall be Class B tension splices and the splices shall be staggered so that no more than 50% of the bars are spliced at any one location.

4. All welded or mechanical splicing devices shall develop 125% of the yield strength of the bar.
 5. Column vertical bars shall lap 30 bar diameters with dowels at the base of the column unless otherwise noted. Dowels shall be the same size and quantity as column vertical bars unless otherwise noted.
 6. All splices not otherwise shown or specified shall be Class B tension lap splices.
- E. Tolerances: Place bars in the locations indicated within the tolerances conforming to the CRSI "Manual of Standard Practice".
- F. Welded Wire Mesh: Install welded wire fabric in as long of a length as practicable and lay flat before placing concrete.
1. Use only mat welded wire fabric. Do not use welded wire fabric from rolls.
 2. Support and tie mesh to prevent movement during concrete placement.
 3. Lap adjoining pieces at least one full mesh and lace splices with wire.
 4. Provide, at a minimum, supports for welded wire fabric according to the Table in Section 2.2.D.3. Confirm the adequacy of the support spacings listed therein for the anticipated construction loads. Increase the number of supports, if necessary, to assure that the final position of the welded wire fabric will conform to that shown on the drawings.
 5. Do not place welded wire fabric on the subbase surface and then hook or "pull up" the reinforcement during concrete placement.
 6. Do not lay welded wire fabric on top of the freshly placed concrete and then "walk it" into place.

3.5 PLACING CONCRETE

- A. Preparation
1. Remove foreign matter accumulated in the forms.
 2. Rigidly close openings left in the formwork.
 3. Wet wood forms sufficiently to tighten up cracks. Wet other material sufficiently to maintain workability of the concrete.
 4. Use only clean tools.
 5. Provide and maintain sufficient tools and equipment on hand to facilitate uninterrupted placement of the concrete.
 6. Before commencing concrete, inspect and complete installation of formwork, reinforcing steel and all items to be embedded or cast-in.

B. Conveying

1. Transport and handle concrete from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete.
2. Provide equipment for lifting, dumping, chuting, pumping or conveying the concrete, of such size and design as to insure a practically continuous flow of concrete at the delivery and without separation of materials.
3. Use hoppers and elephant trunks where necessary to prevent the free fall of concrete for more than 8'.
4. Do not use concrete that is not placed within 1 1/2 hours after water is first introduced into the mix unless the slump is such that it meets the specified limits without the addition of water to the batch.

C. Placing

1. Deposit concrete as nearly as practicable in its final location so as to avoid separation due to rehandling and flowing.
2. Deposit concrete in horizontal layers not deeper than 2', avoiding inclined layers.
3. Place concrete at such a manner that concrete upon which fresh concrete is deposited is still plastic.
4. Bring slab surfaces to the correct level with screeds set to the proper elevation.

D. Hot Weather Placement: Place concrete in hot weather in accordance with ACI 305 "Hot Weather Concreting" and as specified herein.

1. Do not place concrete whose temperature exceeds 100°F.
2. Thoroughly wet forms and reinforcing prior to placement of concrete.
3. Use additional set retarder as necessary to increase set time.
4. Limit the size of the pour where it may reduce the likelihood of cold joints due to reduced set time.
5. Shade the fresh concrete as soon as possible after placing.
6. Start curing as soon as the concrete is sufficiently hard to permit without damage.

E. Cold Weather Placement: Place concrete in cold weather in accordance with ACI 306 and as specified herein.

1. Except when authorized specifically by the Engineer, do not place concrete when the atmospheric temperature is below 40°F.

2. When cold weather placement is approved by the Engineer, heat either the mixing water or aggregate or both so that the concrete temperature is between 65°F and 85°F.
3. Protect the freshly placed concrete by adequate housing or covering and provide heat to maintain a temperature of not less than 50°F for not less than four days.
4. Do not add salts, chemicals, or other materials to the concrete mix to lower the freezing point of the concrete.

F. Consolidation

1. Consolidate each layer of concrete immediately after placing, by use of internal concrete vibrators supplemented by hand spading, rodding, or tamping.
 - a. Use vibrators having a 2" head diameter and a minimum frequency of 8000 vibrations per second.
 - b. Provide sufficient number of vibrators to properly consolidate the concrete, keeping up with placement operations.
 - c. Provide at least one spare vibrator on site.
2. Insert and withdraw vibrators at points approximately 18" apart.
3. Do not vibrate forms or reinforcement.
4. Do not use vibrators to transport concrete inside the forms.

3.6 PROTECTION

- A. Protect the surface finish of newly placed concrete from damage by rainwater or construction traffic.
- B. Do not apply design loads to structures until the concrete has obtained the specified strength.
 1. Do not backfill against walls until they have reached the specified strength and all supporting or bracing walls, slabs, etc. have also reached the specified strength, unless otherwise permitted by the Engineer.
 2. Protect structures from construction overloads.

3.7 CURING

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures and mechanical injury.
- B. Continuously cure concrete for a period of not less than 7 days after placement.
 1. When seven-day cylinder breaks indicate, in the opinion of the Engineer, the possibility of low strength concrete, provide additional curing as per the request of the Engineer.

2. When temperatures during the curing period fall below 40°F, provide additional curing time as directed by the Engineer.
- C. Unless otherwise directed by the Engineer, cure concrete not in contact with forms in accordance with one of the following procedures:
1. Ponding or Sprinkling: Keep entire concrete surface wet by continuously sprinkling or by allowing water to pond, covering all surfaces.
 2. Wet Burlap: Thoroughly wet and cover all concrete surfaces with wet burlap mats as soon as the concrete has set sufficiently to avoid marring the surface.
 - a. Keep the burlap continuously wet during the curing period.
 3. Curing Blankets: Thoroughly wet concrete surfaces to be cured and cover with curing blankets as soon as the concrete has set sufficiently to avoid marring the surface.
 - a. Weight the blankets down to maintain close contact with the concrete surface.
 - b. Use sheets of waterproof Kraft paper with the joints between sheets taped continuously; or
 - c. Use sheets of 4 mil or thicker polyethylene with the joints between sheets continuously taped.
 4. Wet Sand: Apply a layer of sand over the entire surface and keep it continuously wet.
 5. Curing Compound: Apply curing compound immediately after completion of the finish on unformed surfaces and within two hours after removal of forms on formed surfaces.
 - a. Spray the entire surface with two coats of liquid curing compound, applying the second coat in the direction of 90° to the first coat.
 - b. Apply compound in accordance with the manufacturer's instructions to cover the surface with a uniform film which will seal thoroughly.
- D. Hot Weather: When necessary, provide wind breaks, shading, fog spraying, sprinkling, ponding or wet covering with a light colored material applying as quickly as concrete hardening and finishing operations will allow.

3.8 CONCRETE FINISHING

- A. Finish Schedule: Unless otherwise indicated on the drawings, finish all concrete surfaces in accordance with the following schedule:
1. Form Finish: Formed surfaces not ordinarily exposed to view, including:

- a. Interior walls of open tanks below a line one foot lower than the lowest normal water level.
 - b. The underside of slabs not exposed to view.
 - c. Walls below grade.
2. Cementations Coating: All formed surfaces exposed to view including:
- a. Interior walls of tanks above a line one foot lower than the lowest normal water level.
 - b. The underside of slabs, soffits, etc. exposed to view.
3. Float Finish: Slab surfaces not exposed to view or not receiving an applied thin finish, including:
- a. Bottom slabs of tanks or structures containing water sewage or other liquid.
 - b. Foundations not exposed to view.
 - c. Roof slabs to be covered with insulation and/or built-up roofing.
4. Trowel Finish: Interior slab surfaces exposed to view or to receive an applied thin film coating or floor finish, including:
- a. Interior, indoor slabs and floors of buildings.
 - b. Surfaces on which mechanical equipment moves.
 - c. Floors receiving vinyl tile, resilient flooring, carpet, paint, etc.
5. Broom Finish: Exterior, outdoor slabs exposed to view including:
- a. Outdoor floor slabs and walkways.
 - b. Other floors which may become wet or otherwise require a non-skid surface.
 - c. Sidewalks and concrete pavements.
6. Scratch Finish: Surfaces which are to receive a thick topping or additional concrete cast against them including:
- a. Surfaces receiving concrete equipment pads.
 - b. Floors receiving concrete topping.
 - c. Construction joints not otherwise keyed.

7. Edge Finish: Exposed edges of slabs not receiving chamfer including:
 - a. Sidewalk edges and joints.
 - b. Pavement edges and joints.
 - c. Other slab edges not chamfered.

B. Finishing Procedures

1. Form Finish

- a. Repair defective concrete.
- b. Fill depressions deeper than 1/2".
- c. Fill tie holes.
- d. Remove fins exceeding 1/2" in height.

2. Cementations Finish

- a. Patch all tie holes and defects and remove all fins.
- b. Within one day of form removal, fill all bug holes, wet the surfaces and rub with carborundum brick until a uniform color and texture are produced; or
- c. Dampen surfaces, brush apply a grout slurry consisting of 1 part portland cement to 1 1/2 parts sand, and rub the surface vigorously with a stone. Remove all excess grout.
- d. Provide a two coat cement base waterproofing, sealing finish of Thoroseal and Thoroseal Plaster Mix as manufactured by Standard Dry Wall Products, Inc. or an approved equal.
 - (1) Patch all tie holes and defects and removal all fins, and clean surface of all dirt, laitance, grease, form treatments, curing compounds, etc.
 - (2) Key coat: Apply key coat of Thoroseal at a rate of two (2) lbs. per sq.yd. by fiber brush. Mix material using one part of Acryl 60 to three parts clean water. Should material start to drag during application, dampen surface with water. During hot weather periods, dampen surfaces with water prior to application of key coat material. Key coat shall be allowed to cure for five (5) days before applying finish coat.
 - (3) Apply a finish coat consisting of a four (4) to six (6) lbs. per sq.yd. application of Thoroseal Plaster Mix using steel trowel or spray gun. Color shall be pearl gray unless otherwise noted. Mix dry material using one (1) part Acryl 60 to three (3) parts clean water.

Firmly press the mix into all voids and level with a steel trowel. When surface is set so that it will not roll or lift, float it uniformly using a sponge float.

3. Float Finish
 - a. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
 - b. Cut down all high spots and fill all low spots and float the slab to a uniform sandy texture.
4. Trowel Finish
 - a. Float finish as specified herein.
 - b. Power trowel to a smooth surface free of defects.
 - c. After the surface has hardened sufficiently, hand trowel until a ringing sound is produced as the trowel is moved over the concrete surface.
5. Broom Finish
 - a. Float finish as specified herein.
 - b. Provide a scored texture by drawing a broom across the surface.
6. Scratch Surface
 - a. Screed the surface to the proper elevations.
 - b. Roughen with rakes or stiff brushes.
7. Edge Finish: Tool slab edges and joints with a 3/8" radius edging tool.

3.9 SURFACE REPAIR

- A. Patching Mortar
 1. Make a patching mortar consisting of 1 part portland cement to 2 1/2 parts sand by damp loose volume.
 2. Mix the mortar using one part acrylic bonding admixture to two parts water.
- B. Tie Holes: Clean and dampen all tie holes and fill solidly with patching mortar.
- C. Surface Defects
 1. Remove all defective concrete down to sound solid concrete.
 2. Chip edges perpendicular to the concrete surface or slightly undercut, allowing no feather edges.

3. Dampen surfaces to be patched.
 4. Patch defects by filling solidly with repair mortar.
- D. Allow the Engineer to inspect the work before placing the patching mortar.
- E. Repair defective areas greater than 1 sq.ft. or deeper than 1 1/2" as directed by the Engineer using materials approved by the Engineer at no additional expense to the Owner.

3.10 JOINTS

A. Construction Joints

1. Unless otherwise approved by the Engineer, provide construction joints as shown on the drawings.
2. If additional construction joints are found to be required, secure the Engineer's approval of joint design and location prior to start of concrete placement.
3. Continue all reinforcing across construction joints and provide 1 1/2" deep keyways unless indicated otherwise on the drawings.
 - a. Form keyways in place.
4. Provide water stops in all construction joints of liquid containing structures, structures below grade or other structures as shown on the drawings.

B. Expansion Joints

1. Provide expansion joints of size, type and locations as shown on the drawings.
2. Do not permit reinforcement or other embedded metal items that are being bonded with concrete (except smooth dowels bonded on only one side of the joints, where indicated on the drawings) to extend continuously through any expansion joint.
3. Provide water stops where required.

C. Control or Contraction Joints

1. Locate and construct control and contraction joints in accordance with the drawings.
2. Where no specific joint pattern is indicated in slabs on grade or concrete pavements, submit a proposed joint layout to the Engineer for approval.
3. Where no specific joint details are shown on the drawings, joints may be tooled, preformed or saw-cut.
4. Saw-cut joints as soon as the concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw.

3.11 FIELD QUALITY CONTROL

A. Concrete Cylinder Tests

1. During construction, prepare test cylinders for compressive strength testing, using 6" diameter by 12" long single use molds, complying with ASTM C31.
 - a. Make a set of three test cylinders from each pour of 50 cubic yards or less, plus one additional set of cylinders for each additional 50 cubic yards or fraction thereof.
 - b. Identify each and tag cylinder as to date of pour and location of concrete which it represents.
 - c. Deliver cylinders to testing lab selected by the Owner.
 - d. Cost for preparation and delivery of cylinders shall be borne by the Contractor. Cost for testing cylinders will be borne by the Owner.
2. Should strengths shown by test cylinders fail to meet specified strengths for the concrete represented, then:
 - a. Engineer shall have the right to require changes in the mix proportions as he deems necessary on the remainder of the work.
 - b. Additional curing of those portions of the structure represented by the failed test cylinders shall be accomplished as directed by the Engineer.
 - c. Upon failure of the additional curing to bring the concrete up to specified strength requirements, strengthening or replacement of those portions of the structure shall be as directed by the Engineer.
 - d. The Engineer may require additional testing of concrete in question by either non-destructive methods such as the Swiss Hammer, Windsor Probe or Ultrasonics or by coring and testing the concrete in question in accordance with ASTM C42. Such testing shall be performed at no additional cost to the Owner.

B. Other Field Concrete Tests

1. Slump tests: Either the Engineer or a testing laboratory representative will make slump tests of concrete as it is discharged from the mixer.
 - a. Slump test may be made on any concrete batch at the discretion of the Engineer.
 - b. Failure to meet specified slump requirements (prior to addition of any superplasticizers) will be cause for rejection of the concrete.
2. Temperature: The concrete temperature may be checked at the discretion of the Engineer.

3. Entrained Air: Air content of the concrete will be checked by a representative of the testing laboratory at the discretion of the Engineer.
- C. Coordination of Laboratory Services: The Contractor shall be responsible for coordination of laboratory services.
1. Maintain a log recording quantities of each type of concrete placed, date and location of pour.
 2. Inform the testing laboratory of locations and dates of concrete placement and other information as required to be identified in the laboratory's test reports.
- D. Tests required because of extensive honeycombing, poor consolidation of the concrete or any suspected deficiency in the concrete will be paid for by the Contractor.
- E. Dimensional Tolerances
1. Dimensional tolerances for allowable variations from dimensions or locations of concrete work, including the locations of embedded items shall be as given in ACI 301.
 2. Where anchor bolts or other embedded items are required for equipment installation, comply with the manufacturer's tolerances if more stringent than those stated in ACI 301.
- F. Watertight Concrete
1. All liquid containing structures, basements or pits below grade shall be watertight.
 2. Any visible leakage or seepage shall be repaired as instructed by the Engineer at no expense to the Owner.
 3. Where physical evidence of honeycombing, cold joints or other deficiencies which may impair the watertightness of a structure exists, the Engineer may at his discretion call for leak testing of the structure.
 - a. Fill the structure with water and allow to stand for not less than 48 hours.
 - b. Make repairs on the structure until all visible leaks are sealed and the leakage rate of the water in the structure is less than 0.1% of the volume held in the structure per day.
 - c. The cost of testing and repairs shall be performed at no expense to the Owner.
- G. Concrete which fails to meet strength requirements, dimensional tolerances, watertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the Engineer at no expense to the Owner.

3.12 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

PART 1- GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide precast concrete utility structures where shown on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.
 - 2. Section 03300: Cast-in-Place Concrete.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Qualifications of manufacturer: Demonstrate capability to make and provide the specified quality products by attestation of the Prestressed Concrete Institute under the Plant Certification Program.
- C. Referenced manufacturer is Tindall Concrete Products, Inc. Equal precast vaults of other manufacturers conforming to these specifications may be provided with the Engineer's approval.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data, submit:
 - 1. Materials list of items proposed to be provided under this section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Manufacturer's certifications and laboratory test reports required.
 - 4. Shop drawings, prepared in accordance with pertinent provisions of Section 01340 of these Specifications and showing complete information for fabrication and erection of the work of this section including, but not necessarily limited to:
 - a. Member dimensions and cross sections; locations, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.
 - b. Erection procedures, sequence of erection and required handling equipment.

- c. Layout, dimensions and identification of each precast unit corresponding to the sequence and procedure of installation.
- d. Details of inserts, connections and joints, including accessories and construction at openings in the precast units.
- e. Location and details of anchorage devices that are to be embedded in other construction.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.
- B. Delivery, Storage and Handling
 - 1. Deliver the work of this section to the job site in such quantities and at such times as to assure the continuity of construction.
 - 2. Store units at the job site in a manner to prevent cracking, distortion, warping, staining and other physical damage, and in a manner to keep markings visible.
 - 3. Lift and support the units only at designated lifting points or supporting points as shown on the approved shop drawings.

1.5 MANUFACTURER

- A. Not less than five years experience in the manufacture of units similar to the ones specified herein and indicated on the Drawings.
- B. The manufacturer shall be approved by the Engineer prior to the submission of shop drawings.
- C. Plant to be certified under the P.C.I. Plant Certification Program.

PART 2 - PRODUCTS

2.1 DESIGN

- A. Construct structures according to the dimensions as shown on the plans.
- B. Modification
 - 1. Provide complete design, calculations and drawings as called for under Article 1.3 above.
 - 2. Maintain the general design concept as shown, without decreasing or increasing sizes of members and without altering profiles and alignment, except as approved by the Engineer.
 - 3. Make necessary provisions in the design to accommodate stress to be encountered.

C. Standards

1. Design in accordance with pertinent recommendations contained in:
 - a. ACI 301
 - b. ACI 304
 - c. ACI 311
 - d. ACI 318
 - e. ACI 347
 - f. CRSI "Manual of Standard Practice"
 - g. PCI 116
2. Comply with requirements of governmental agencies having jurisdiction.
3. In the event of conflict between or among standards, the more stringent provision shall govern unless directed otherwise by the Engineer.

2.2 REINFORCEMENT AND CONNECTION MATERIALS

- A. Provide reinforcement, accessories and connection materials required in accordance with the final design as approved by the Engineer.
- B. Standards
 1. Meet or exceed the quality specified for similar materials under other sections of these specifications.
 2. For materials not specified under other sections of these specifications, but required for a complete and proper installation, provide new materials, first quality of their respective kinds, as selected by the Contractor, subject to the approval of the Engineer.

2.3 CONCRETE

- A. Design Strength
 1. Unless otherwise indicated on the drawings or approved by the Engineer, design the mix and proportion the concrete to attain a minimum compressive strength of 5000 psi when cured and tested at 28 days in accordance with ASTM C39.
 2. Reinforcing steel to meet requirements of ASTM A615, Grade 60.

2.4 STRUCTURE

- A. The precast units shall be designed for the burial depths shown on the drawings. The precaster shall prepare design analysis and calculations for the unit indicating that allowable stresses will not be exceeded during any and all phases of manufacture, shipping and

handling and installation. This analysis must also include calculations to verify that the units have been designed to withstand all loadings at the burial depths indicated. This analysis shall be performed and sealed by a professional engineer licensed to practice in the state of South Carolina and shall be submitted for review when submitting shop drawings.

- B. The structures shall be capable of adequately supporting the following load conditions: soil weight of 130 pcf; soil angle of internal friction of 10° and varying groundwater table. Design for a uniform load of 100 psf for each floor, and 3500 plf along walls.
- C. To insure proper quality control and supervision, the precast units shall be poured and vibrated using steel forms in a PCI certified manufacturing facility. The precaster shall have the necessary equipment and facilities to perform compressive strength tests on concrete test cylinders.
- D. The structure manufacturer shall closely coordinate locations of all openings, penetrations, embedments, etc. with the Engineer, prior to the pouring of any concrete.

2.5 JOINT SEALANT

- A. Provide a vulcanized butyl rubber sealant of adequate size and quantity to seal joints in the precast vault risers.

2.6 FABRICATION

- A. General
 - 1. Structures to be monolithically poured.
 - 2. Fabricate the work of this section to the sizes and shapes indicated.
 - 3. Provide finished units which are straight, true to size and shape, and within the specified casting tolerances.
 - 4. Make exposed edges sharp, straight and square. Make flat surfaces into a true plane.
 - 5. Warped, cracked, broken, spalled, stained and otherwise defective units will not be acceptable.
 - 6. Place and secure in the forms all anchors, clips, stud bolts, inserts, lifting devices, shear ties and other devices required for handling and installing the precast units and for attachment of subsequent items as indicated or specified.
 - 7. Cast ladder rungs into the units.
 - 8. Provide tongue and groove joints.
 - 9. Provide polypropylene plastic steps reinforced with 3/8" diameter steel rod, M.S.A. Industries, Inc. Model PS-K or equal.
- B. Curing

1. Form cure the work of this Section for a minimum of 20 hours.
 2. Keep wet continuously for not less than six (6) days after being removed from the forms.
 3. Following the curing period, allow the units to air dry for at least four (4) days before being shipped.
- C. Casting Tolerances: Maintain casting, bowing, warping and dimension tolerances with the following maximums:
1. Overall Dimension for Height and Width of Units
 - a. Plus zero of unit dimension to minus 3/32" for 10'0" and over.
 2. Make thickness of units 1/8" maximum.
 3. Bowing or Warping
 - a. Do not exceed 1/360 of the span.
 4. Insert Locations
 - a. Place within 1/4" in each direction.
 5. Opening Dimensions to Figured Dimensions
 - a. Accurate within a tolerance of plus 1/8" to minus zero.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.

3.3 INSTALLATION

- A. Install the work of this section in strict accordance with the original design, the approved shop drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Engineer, anchoring all components firmly into position for long life under hard use.
- B. Set bases level so that walls will be plumb.

- C. Apply joint sealer or ring gasket to wall section(s), set firmly in place, to assure watertight joints.
- D. Powder Actuated Fasteners
 - 1. Do not use powder actuated fasteners for surface attachment of accessory items except as specifically approved by the Engineer and specifically accepted by the precast unit manufacturer.
- E. Liner Installation
 - 1. Install manhole liner in accordance with manufacturer's published directives and procedures.
 - 2. Perform welding by welders certified by the manufacturer.
 - 3. Complete welding to provide a one-piece monolithic concrete protective liner system.
 - 4. Acceptable Welding Techniques
 - a. Extrusion welding
 - b. Wedge welding
 - c. Butt welding
 - d. Hot air welding
 - 5. Perform testing and supervision of the installation and welding by qualified staff only and check when completed by visually checking and by Spark Testing all welded joints.

3.4 FINISH

- A. Comply with pertinent provisions of Section 03300 for cast-in-place concrete.

3.5 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide non-shrink grout for structural grouting, equipment bases, etc. as indicated and needed for a complete and proper installation.
- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.
 - 2. Other provisions concerning Non-Shrink Grout may also be stated in other sections of these specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.
- B. Prevent damage to or contamination of non-shrinking grouting materials during delivery, handling and storage.
- C. Deliver grout to site in polyethylene lined paper bags, not larger than one cubic foot in capacity.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Non-Shrink Grout
 - 1. Provide non-metallic, non-shrink grout.
 - 2. Grout shall evidence no shrinkage when tested in the plastic state, in accordance with ASTM C827, or in the hardened state, in accordance with ASTM CRD588.
 - 3. Initial setting shall not occur in less than 60 minutes.
 - 4. Compressive strength in 24 hours shall not be less than 3000 psi, when tested in accordance with ASTM C109.

- 5. Acceptable Products: U.S. Grout Corporation's Five Star Grout; Sonneborn's SonogROUT; W.R. Bonsal Company's Type A Construction Grout; or equal.
- B. Water: Potable grade.
- C. Gravel: Comply with ASTM C33 for coarse aggregate graded so that 90% passes 3/8" sieve and 90% is retained by No. 4 sieve.

2.2 MIXES

- A. Less than 2" clearance or for difficult grouting locations mix shall consist of grout material and water.
- B. Greater than 2" clearance where coarse aggregate will not obstruct free passage, extend grout by adding ½ pound of gravel to one pound grout material, except where prohibited by manufacturer's recommendations.
- C. Use the minimum amount of water necessary to produce a flowable grout without causing segregation or bleeding.

2.3 MIXING

- A. Mix non-shrink grouting material and water in a mechanical mixing for no less than 3 minutes, unless otherwise approved by the Engineer.
- B. Mix as close to work area as possible and transport the mixture quickly and in a manner that does not permit segregation of materials.
- C. Retempering of grout will not be permitted.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Build leakproof forms that are strong and securely anchored and shored to withstand grout pressures.
- B. Provide ample clearance between formwork and the area to be grouted to permit proper placement of grout.

3.2 SURFACE PREPARATION

- A. Remove all defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by bush-hammering, chipping, or other similar means, until a sound, clean concrete surface is achieved.
- B. Lightly roughen the concrete, but not enough to interfere with the proper placement of grout.
- C. Remove foreign materials from all steel surfaces in contact with grout.
- D. Align, level, and maintain final positioning of all components to be grouted.

- E. Take special precautions during extreme weather conditions according to the manufacturer's written instructions.
- F. Saturate all concrete surfaces with clean water; remove excess water and leave none standing.

3.2 PLACING

- A. Place non-shrink material quickly and continuously by the most practical means permissible: pouring, pumping or under gravity pressure.
- B. Apply grout from one side only to avoid entrapping air.
- C. Final installation shall be thoroughly compacted and free from air pockets.
- D. Do not vibrate the placed grout mixture, or allow it to be placed if the area is being vibrated by nearby equipment.
- E. Do not remove leveling shims for at least 48 hours after grout has been placed.
- F. After shims have been removed, fill voids with plain cement-sand grout.

3.3 CURING

- A. Cure grout for 3 days after placing by keeping wet and covering with curing paper or by another approved method.

3.4 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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DIVISION 11

EQUIPMENT

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PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide plug valves at all locations indicated on the drawings, and as specified herein, complete and ready for operation.
- B. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and sections in Division 1 of these specifications.

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Referenced manufacturer is DeZurik and is named to establish standards of quality. Equal products of other manufacturers conforming to these specifications may be provided upon approval by the Engineer.
- C. Manufacturers to have a minimum of ten (10) years operating experience for the specified valve.
- D. Provide valves with castings and all other components manufactured in the United States.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide non-lubricated, eccentric type plug valves having resilient faced plugs, complying with AWWA Standard C504 and other requirements specified herein.
- B. Furnish screwed, flanged or mechanical joint end connections as indicated on the Drawings.
- C. Provide valves of bolted bonnet design:
 - 1. Valves 4" and larger to be designed to allow repacking without removing the bonnet or actuator, and the packing shall be adjustable.

- 2. Packing to be replaceable with the valve under pressure, with valve open or closed with pressure on either side of the plug.
- D. Provide valves capable of drip-tight shutoff up to full rating with pressure in either direction. Pressure ratings shall be 175 psi for 4" through 12", 150 psi for 14" through 36", and 125 psi for 42" and larger.
- E. Valve bodies shall be cast iron complying with ASTM A126, Class B and AWWA Standard C-504-80, Section 5.4.
- F. All exposed nuts, bolts, springs, etc. shall be stainless steel on all valves.

2.2 PORT AREAS

- A. 4" through 20" valves, not less than 80% of full pipe area.
- B. 24" and larger, not less than 70% of full pipe area.
 - 1. Port to be smoothly shaped with an unobstructed waterway when open.

2.3 SEATS

- A. Provide corrosion resistant seats complying with AWWA Standard C507-73 and AWWA Standard C504.
- B. 3" and larger valves to have a 1/8" thick hand welded-in overlay of not less than 90% nickel content on all surfaces contacting the plug face.
 - 1. Seat to be raised 1/8" from the valve body and machined to a smooth finish.
- C. Screwed-in or bolted-in seats are not acceptable.

2.4 BEARINGS

- A. Provide valves through 20" size with permanently lubricated, Type 316 stainless steel bearings in the upper and lower plug stem journals.
- B. Provide 24" and larger valves with bronze bearings and stainless steel sleeves in the upper and lower plug stem journals.
- C. Bearings to comply with AWWA Standard C507-73 and AWWA Standard C504.
- D. Lower bearing housing to be raised from the body to reduce the possibility of grit and sand entering the bearing housing.

2.5 FLANGED END CONNECTIONS

- A. Provide, where indicated, valves with flanged ends, faced and drilled to ANSI 125/150 lb. standard.
- B. Flanged valves through 12" to have face-to-face dimensions of AWWA standard gate valves.

2.6 RESILIENT PLUG FACING

- A. Provide neoprene plug facings vulcanized to the plug and suitable for use with domestic wastewater.
- B. Plug to be one piece with integral stem through the actuator.
- C. Do not use plugs with cast inlays.

2.7 BURIED SERVICE VALVES

- A. Provide seals on all shafts and gaskets on valve covers to prevent entry of water and dirt.

2.8 PRESSURE GAUGE TAPS

- A. Provide ¼” tap with plug on both ends of the valve for pressure gauge connections.

2.9 ACTUATORS

- A. Manual valves to be provided with lever or gear actuators and tee wrenches, extension stems, floor stands, chain wheels, etc. as indicated on the drawings.
 - 1. Provide a lever for each lever operated valve.
 - 2. Provide one tee wrench for every 5 valves utilizing the tee wrench operation.
- B. Valves furnished for installation in a valve box to be provided with a 2” square operating nut and extension within 18” of the top of the valve box.
- C. Provide 4” and larger valves with gear actuators.
 - 1. Provide gear to fit on hexagonal valve shaft to allow operation without the use of roll pins.
 - a. Adaptor between plug shaft and actuator shaft is not acceptable.
 - 2. Hand wheel and chain wheel components between the input and the stop-limiting devices to be designed to withstand, without damage, a pull of 200 lbs. as required by the American Water Works Association (AWWA) Standard C504-74 Section 11.2.3.
 - 3. Pulley and chain for chain wheel actuators to be hot-dipped galvanized unless otherwise noted on the plans.
 - 4. Gear sector to hand wheel diameter ratio not to exceed 2:1.
 - 5. Provide spring loaded U-cup seals on gear sector of gear box housing.
 - a. Do not provide o-ring seals.

6. Gear Actuators, Normal Service
 - a. Enclose all gearing in a semi-steel housing suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt or water into the actuator.
 - b. Support actuator shaft and quadrant on permanently lubricated bronze bearings.
 - c. Provide valve position indicator and an adjustable stop to set closing torque.
 - d. All exposed nuts, bolts and washers to be stainless steel.
 - e. Provide air gap between the actuator and the valve body to prevent leakage from the valve into the actuator.

7. Gear Actuators, Buried Service
 - a. Provide neoprene seals on all shafts and gaskets on actuator covers to prevent entry of water and dirt.
 - b. Mounting brackets to be totally enclosed with gasket seals.
 - c. Support actuator shaft and quadrant on permanently lubricated bronze bearings.
 - d. All exposed nuts, bolts and washers to be stainless steel.

PART 3 - EXECUTION

3.1 GENERAL

- A. Handle, store and install all valves complying with the manufacturer's recommendations and the drawings.
- B. Valves installed in horizontal pipe runs shall be mounted with the plug horizontal and at the top of the body when the valve is open.

3.2 PAINTING

- A. Exposed Valves
 1. Factory Painting
 - a. Sandblast to SSPC-10 Near White Metal.
 - b. Prime exterior with Themec Series I Omnithane Primer, 3.0 dry mils.
 - c. Paint interior of valve with 2 coats of coal tar epoxy, minimum 14 mils dry thickness.

2. Field Painting
 - a. Comply with manufacturer recommendations.
- B. Buried Valves
 1. Sandblast to SSPC-10 Near White metal.
- C. Paint exterior and interior of valve with 2 coats of coal tar epoxy, minimum 14 mils dry thickness.

3.3 MEASUREMENT AND PAYMENT

- A. Comply with the pertinent provisions of Section 01025.

END OF SECTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide submersible sewage pumps for the duplex sewage lift station, including, but not necessarily limited to, two submersible sewage pumps, guide rail mounting system, guide rails, discharge seal and elbow, and motor control center with liquid level control system, to provide station complete and ready for operation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 16400 - Electrical.

1.2 QUALITY ASSURANCE

- A. Referenced manufacturer is Sulzer/ABS and is named to establish standards of quality. Equal products of other manufacturers complying with all requirements of these specifications and conforming to the Bid Form may be provided upon approval by the Engineer.
- B. The heavy-duty submersible wastewater pump(s) shall be capable of handling raw unscreened sewage, storm water, and other similar solids-laden fluids without clogging. The pump(s) shall be driven by a Premium Efficiency motor, providing the highest levels of operational reliability and energy efficiency.
- C. Alternate manufacturers must submit their qualifications and pump proposals a minimum of **10 days** prior to the bid opening date for the Engineer to review the material and to determine if the proposed pump (including control panel) is an approved equal. Only pump manufacturers approved prior to the bid opening will be considered. The proposals shall be reviewed based on the specified requirements detailed in this specification section.
- D. The Supplier's attention is directed to the fact that the pumps and controls are an integrated system in the view of the Engineer and as such shall be furnished by one vendor who shall provide all the equipment and appurtenances regardless of the manufacture and be responsible to the Supplier for satisfactory operation of the total system.
- E. The pump manufacturer shall have a minimum of 1,000 pumping units of similar type pumps, installed and operating for not less than five (5) years in the United States.
- F. Technical services:
 - 1. Provide a service engineer, complying with requirements of Section 01660 for the following periods of time for each pump station:
 - a. For start-up and performance testing: Two days - Two trips.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 2. Shop drawings showing plan, elevation and sectional views, materials of construction, and other pertinent information.
- C. Six (6) copies of factory and field test reports.
- D. Provide Operation and Maintenance manuals complying with Section 01650.

1.4 PRODUCT DELIVERY

- A. Comply with pertinent provisions of Section 01640.

1.5 WARRANTY

- A. Comply with provisions of Section 01650.
- B. The pump manufacturer shall warrant the units being supplied to the Owner against defects in workmanship and material for a period of five (5) years or 10,000 hours under the Municipal Wastewater Permanent Installation Warranty Policy under normal use, operating and service. The warranty shall be in printed form and apply to all similar units.

PART 2 - PRODUCTS

2.1 PUMPS

- A. General:
 - 1. Provide submersible pumps capable of pumping raw sewage.
 - 2. Provide 4-inch discharge with ANSI 125 lb standard cast iron flange fitting or cast with volute.
 - 3. Provide pump openings and passages adequate to pass solids typically found in unscreened wastewater" and any trash or stringy material that can pass through an average house collection system.
 - 4. Pump components shall be cast iron, ASTM A 48, Class 35B and all exposed fasteners and washers shall be Type 316 stainless steel.
 - 5. Pump lift handle to be Type 316 stainless steel.
 - 6. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of zinc phosphate primer followed by a high solids two-part epoxy paint finish on the exterior of the pump.
 - 7. Each pump shall be operated in a lead-lag sequence and be on an alternating cycle.

B. Impeller:

1. Impeller shall be of the vortex design, capable of passing solids typically found in unscreened wastewater.
2. Gray cast iron, Class 35B, balanced dynamically to the ISO 10816 standard to provide smooth, vibration-free operation.
3. Paint impeller a factory applied spray coating of zinc phosphate primer followed by a high solids two-part epoxy paint finish.
4. Provide adjustable wear plate as described in C below.
5. Provide slip fit connection onto the motor shaft, driven by a shaft key, and shall be securely fastened to the shaft by a stainless-steel screw. A positively engaged, ratcheting washer assembly shall prevent the screw from loosening.
6. The head of the impeller screw shall be effectively recessed within the impeller bore to prevent disruption of the flow stream and loss of hydraulic efficiency.

C. Wear Plate:

1. The wear plate shall be self-cleaning.
2. Wear plate shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves as well as an outward spiral V-shaped groove on the side facing the impeller. The dual groove system shall be used to shred and force stringy solids outward from the impeller and through the pump discharge.
3. The wear plate shall be mounted to the volute with three stainless steel securing screws and three stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency.
4. The wear plate shall be factory mounted to the volute in a fixed position with metal-to-metal contact on machined surfaces to insure optimal clearance and efficiency at startup. Future adjustments shall be easily accomplished by removing three securing screws and rotating the plate 45 degrees to the adjustment position. Adjustment to allow for wear and restore peak pumping performance shall then be accomplished using standard tools, and without requiring disassembly of the pump.
5. The use of fixed or non-adjustable wear plates or rings, systems that require disassembly of the pump, or shimming of the impeller to facilitate adjustment, shall not be considered equal. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and tapped to accept standard 4-inch ANSI class 125/150 flanged fittings.

D. Volute:

1. The pump volute shall be a single-piece, gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B), non-concentric design with centerline discharge.
2. Passages shall be smooth and large enough to pass any solids which may enter through the impeller. The discharge size shall be 4 inches. The discharge flange design shall permit attachment to standard ANSI and DIN flanges/appurtenances. The discharge flange shall be radially slotted to accept both 4-inch ANSI class 125/150 and metric DN100 flanged fittings. Proprietary or nonstandard flange dimensions shall not be considered acceptable.
3. The minimum working pressure of the volute and pump assembly shall be 16 bar (232 psi).

E. Shaft:

1. The pump shaft and motor shaft shall be an integral, one-piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system.
2. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed .05 mm (.002 inch) at the lower seal during normal pump operation.
3. Each shaft shall be of stainless steel, 1.4021 (AISI 420), and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals, and impeller.
4. Carbon steel, chrome plated, or multi-piece welded shafts shall not be considered adequate or equal.

F. Bearings:

1. The pump shaft shall rotate on two (2) permanently lubricated bearings with a B-10 bearing life of 50,000 hours.
2. The upper bearing shall be single deep groove ball bearing.
3. The lower bearing shall be a two-row angular contact ball bearing.
4. The bearings shall be manufactured by a major internationally known manufacturer of high-quality bearings and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.

G. Watertight seals:

1. Machine and fit all mating surfaces where watertight sealing is required with nitrile rubber O-rings.
2. Fittings shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces.
3. Do not provide gaskets, elliptical O-rings, grease or other devices.

H. Mechanical seals:

1. Provide each pump with a tandem mechanical shaft seal system.
2. Operate the upper of the tandem set of seals in an oil chamber located just below the stator housing.
3. The upper, secondary seal unit, located between the lubricant chamber and motor housing, shall contain one stationary industrial duty silicon-carbide seal ring, and one rotating industrial duty silicon-carbide seal ring and it shall function as an independent secondary barrier between the pumped liquid and the stator bearings.
4. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty silicon-carbide seal ring and one rotating industrial duty silicon-carbide seal ring.
5. Provide lower set of seals to function as the primary barrier between the pumped liquid and the stator housing.
6. The seals shall require neither maintenance nor adjustment but shall be easily inspected and replaceable.
7. Do not provide conventional double mechanical seals containing either a common single or double spring acting between the upper and lower units.
8. Each seal interface shall be held in contact by its own spring system.

9. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe nontoxic material.
10. Provide all seal hardware of stainless steel.
11. The following seal types shall not be considered equal: Seals of proprietary design or seals manufactured by other than major independent seal manufacturing companies. Seals requiring set screws, pins, or other mechanical locking devices to hold the seal in place, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces, or any system requiring a pressure differential to seat the seal and ensure sealing.

I. Performance:

1. The specified pump is a Sulzer Model XFP101G-VX or approved equal. Each pump shall have the necessary characteristics to perform under these operating conditions listed below:

Description	Flat Rock PS
Capacity (gpm)	350
TDH (feet)	163
Static Head (feet)	130
Efficiency (%)	46
Minimum shut-off head (feet)	230
Maximum speed (rpm)	3600

2. Total discharge head (TDH) as listed on schedule herein does not include losses in the pump from the suction flange to the discharge flange. Therefore, provisions shall be made in the design of the pump to accommodate this additional head. These losses shall also be included in the pump efficiencies. The efficiency listed is field efficiency and includes the efficiencies of the bowl corrected for all losses chargeable to the pump, including losses for shafts, column, and discharge head or elbow. Motor efficiency is not included in the field efficiency.

2.2 PUMP MOTOR

A. General:

1. Provide submersible type motor, designed for continuous duty, capable of sustaining a minimum of fifteen (15) starts per hour. The maximum continuous temperature of the pumped liquid shall be 40°C (104°F), and intermittently up to 50°C (122°F).
2. Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30:2008, level IE3 and NEMA Premium. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third-party certifying agency. A certificate shall be available upon request.
3. Motor shall be housed in a water-tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B), enclosure, capable of continuous submerged operation underwater to a depth of 20 meters (65 feet) and shall have an IP68 protection rating.
4. Furnish motor and pump as integral unit.

5. Air filled, squirrel cage induction, shell type design, with Class H insulation system and Class H materials rated for continuous duty in 40° C (104° F) liquids.
 6. Furnish motor frame and end shields of cast iron.
 7. Provide stainless steel hardware and shaft.
 8. Minimum Service factor to be 1.15.
 9. Provide stator heat-shrink fitted to shaft.
 - a. Dip and bake stator in Class H varnish.
 - b. Do not use bolts, pins or other fastening devices requiring penetration of the stator housing.
 10. Provide rotor bars and short circuit rings of aluminum.
 11. Motor to be non-overloading through the range of pump's operating curve.
 12. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase-to-phase voltage imbalance tolerance of 1%. The motor shall have a NEMA Class A temperature rise, providing cool operation under all operating conditions.
 13. The motor shall be FM approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives.
- B. Provide a cable entry water seal system to preclude specific torque requirements to ensure a watertight and submersible seal.
1. Provide the cable entry of a single cylindrical elastomer grommet, flanked by stainless steel washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable.
 2. The assembly shall bear against a shoulder in the pump top.
 3. Separate the cable entry junction chamber and motor by a stator lead sealing gland or terminal board to isolate the motor interior from foreign material gaining access through the pump top.
 4. Do not use epoxies, silicones, or other secondary sealing systems.
- C. Provide pre-lubricated bearings with minimum B-10 life of 50,000 hours.
- D. Thermal protection:
1. Provide motor rated thermally to NEMA MG1-12.42.
 2. Protect by means of three (3) thermostatic switches (one in each phase) in the stator windings.
- E. Junction chamber:
1. Seal the junction chamber containing the terminal board from the motor by elastomer compression seal (O-ring).
 2. Make the connection between the cable conductors and stator leads with pin and sleeve connectors integrated into a water tight "plug" assembly which allows the cable to be easily removed from the pump motor.

F. Motor characteristics shall be:

Description	Flat Rock PS
Minimum Motor Hp	40.2
Speed (rpm)	3540
Operational Current	480 Volt, 3 phase

G. Power Cable:

1. Power cables shall be sized according to NEC and CSA standards and shall be of sufficient length to reach the junction box without requiring splices. The outer jacket of the cable shall be of chlorinated polyethylene (CPE) and be oil, water, and UV resistant, capable of continuous submerged operation underwater to a depth of 65 feet.

2.3 DISCHARGE CONNECTION

- A. Provide a permanently installed discharge connection system which will permit removal and installation of pump without the necessity of an operator entering the wetwell.
- B. The pump(s) shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service.
- C. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.
- D. Provide a sliding guide bracket to be bolted to the discharge flange of the pump.
- E. The entire weight of the pumping unit shall be guided by no less than one guide bar and pressed tightly against the discharge connection elbow with metal-to-metal contact.
- F. A molded profile gasket shall provide positive sealing between the guide bracket and the base assembly. The profile gasket shall be positively fixed on the bracket assembly and shall be easily replaceable without entering the wet well.
- G. Do not bear any portion of the pump directly on the floor of the sump.
- H. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard pump flanges, so that the pump mounting is nonproprietary, and any pump with a standard discharge flange can be mounted on the base assembly.

2.4 DISCHARGE ELBOW

- A. Cast from gray cast iron complying with ASTM A 48, Class 30.
- B. Provide vertical leg with 4-inch ANSI Class 125 lb. flange.
- C. Provide horizontal or inlet leg with a flat machined face for forming an effective seal with the lip seal on pump.
- D. Provide elbow with an integral cast iron base for anchoring and support of discharge piping and pump to wetwell floor.

2.5 GUIDE RAILS

- A. Provide for each pump one length of 2", Schedule 40, Type 304 stainless steel pipe with pilots as indicated on contract drawings.
- B. Provide Type 316 stainless steel top pilots, Halliday Metals or equal.

2.6 PUMP GUIDES

- A. Attach to pump volute with stainless steel head cap screws.

2.7 LIFT CABLE

- A. Provide each pump and motor with adequately sized stainless steel lifting cable.
- B. Length shall reach top of station plus an additional 6 feet.
- C. Provision shall be made for attaching upper end of this cable to the wetwell access frame with Type 316 stainless steel clip and stainless-steel eye nut.
- D. Connect cable to pump using a Type 316 stainless steel screw pin shackle.

2.8 HARDWARE

- A. All bolts, machine screws, nuts, washers, and lockwashers for complete assembly of wetwell access cover, guide rails, and discharge elbow shall be furnished by manufacturer in Type 316 stainless steel.

2.9 WETWELL ACCESS

- A. Provide wetwell access hatch as shown on the project drawings.

2.10 LEVEL CONTROL

- A. Provide a submersible level transducer for primary control of the pumps. Transducer to be manufactured by Rosemount, KPSI, or approved equal.
- B. Provide five (5) micro float switches, single action design, capable of withstanding water penetration under 25 feet of water with at least a 3 to 1 safety factor. Four (4) floats will be used for backup control of the pumps and shall be required for the following:
 - 1. Pumps Off
 - 2. Lead Pump On
 - 3. Lag Pump On
 - 4. High Level Alarm

The fifth float will be installed in the valve / metering vault as a high-level alarm.

- C. Provide integrally weighted floats:
 - 1. Do not use float switches that require pole mounting.

- D. Provide for duplex operation:
 - 1. Utilize "LEAD/LAG" principle using submersible level transducer.
 - 2. Design circuitry so that operation of the "LAG" pump start circuit is not contingent on proper operation of the "LEAD" pump start circuit.
- E. Switches:
 - 1. Micro or mercury switch sealed in a polypropylene housing with not less than 30' of cable or of adequate length to terminate in junction box below control panel without splicing.
 - 2. Provide polypropylene cord grips and mounting hardware for switches.
- F. Conduit seals: Provide seals suitable for Class 1, Division 1 and 2, Group D, hazardous locations.
- G. Cable holder:
 - 1. Provide stainless steel, six hook design, Halliday Metals or equal.
 - 2. Mount with stainless steel anchors.

2.11 PUMP CONTROL PANEL

- A. Enclosure:
 - 1. Provide 14 gauge Type 304 stainless steel enclosure complying with NEMA 4X, gasketed, with rain shield.
 - a. Provide for pole mounting with stainless steel u-bolts or clamps.
 - 2. Provide a single 3-point locking latch.
 - a. Attach with stainless steel screws.
 - 3. Include removable inner swing panel fabricated of aluminum having a minimum thickness of 0.125" mounted on a continuous stainless steel piano type hinge.
 - a. Panel shall be of adequate size to completely cover all wiring and components mounted on the back panel and shall make provisions for the mounting of all basic and optional controls and instruments.
 - b. Panel shall have a minimum horizontal swing of 90° and shall be held in the closed position with straight slot screws.
 - 4. Provide removable back panel of 0.125" minimum thickness, aluminum or painted steel, attached to enclosure on collar studs, and of adequate size to accommodate all basic and optional components.
 - a. Mount components to back panel securely utilizing screws and lockwashers.
 - b. Tap panel to accept mounting screws.
 - c. Do not use any self-tapping screws.
 - 5. Back panel to be painted with two coats of white epoxy enamel.
 - 6. Provide a fluorescent light in the top of the panel of maximum size to fit the panel. Minimum 18", maximum 48".
 - a. Wire to a two-pole limit switch mounted on the door of the enclosure.
 - b. Door opening will automatically turn light on.
 - c. Door closing will automatically turn light off.
 - 7. Provide engraved nameplates on door-mounted hardware.
 - a. Attach with stainless steel screws.

- B. Motor starters:
1. For motors 15 horsepower or less in size:
 - a. Provide NEMA rated open frame, across-the-line, non-reversing type, as manufactured by Allen Bradley, Square D (Class 8539) or equal.
 2. For motors more than 15 horsepower:
 - a. Provide reduced voltage solid state starters for each pump. Starters shall be Altistart 22 manufactured by Square D with full voltage NEMA rated bypass starters. Each bypass starter shall be controlled manually via a RVSS-BYPASS selector switch.
- C. Components:
1. Provide power disconnect on each circuit breaker with operator handle located on exterior of inner swing panel.
 - a. Include interlock permitting swing panel to be opened only when circuit breakers are in the "OFF" position.
 2. Provide "H-O-A" switches for each motor.
 - a. Provide UL rated, heavy duty, 600 VAC, NEMA 4X, oil-tight switches, Allen Bradley Series 800H or Square D Class 9001 SK or equal.
 - b. "Hand" position not to override motor overload shutdown.
 3. Provide the following components with the panel:
 - a. Green Pilot run light for each motor.
 - b. Lockable enclosure.
 - c. Condensation heater with thermostat.
 - d. Undervoltage, phase failure and phase reversal protection unit, TimeMark Model 265, or Engineer-approved equal.
 - e. Red flashing High level alarm indication light mounted on the top of the panel.
 - f. Alarm horn with silence button. Alarm horn decibel output shall be adjustable.
 - g. Reset-motor over temperature.
 - h. GFI 20A duplex receptacle with stainless steel cover with 5 amp breaker.
 - i. Weatherproof switch for flood light mounted on exterior of enclosure.
 - j. Control relays.
 - k. Remote alarm terminals.
 - l. Red "High temperature" indicator lamps with reset pushbuttons.
 - m. White control "Power on" indicating lamp.
 - n. Temperature failure test pushbuttons.
 - o. Red seal failure indication lights
- D. Pump alternator relay:
1. Provide relay of electrical/mechanical industrial design, Series ARB, as manufactured by Diversified Electronics or equal.
 2. Include three position selector switch to override automatic alternator and provide manual selection of either Pump No. 1 or No. 2 as the "LEAD" pump, Allen Bradley Series 800H or Square D Class 9001SK or equal.
- E. High temperature shutdown:
1. Provide high temperature shutdown for each motor utilizing the temperature switches embedded in the motor windings.

- a. Under high temperature conditions switch shall open, de-energizing the motor starter and stopping the pump motor.
 - b. High motor temperature shutdown device in motor shall be automatic reset type however a high temperature condition shall require that the reset pushbutton be pressed to reset the pump and return it to operation.
- F. Provide overload reset device operable without opening the inner swing panel.
- G. Provide the following components and mount on the back plate:
- 1. Provide a 115V 2 kva control circuit transformer (open core and coil type) with primary circuit breaker and secondary circuit breakers for:
 - a. Control
 - b. Duplex receptacle (5 amp)
 - c. Condensation heater
 - d. Area light (5 amp)
 - e. Monitoring equipment
 - 2. Provide an automatic shut-off timer for alarm horn (0-20 min. adjustable).
 - 3. Provide lightning arrestor, Delta Type "LA".
 - a. Do not substitute.
 - 4. Provide power terminals and control terminals.
- H. Design control sequence so that panel is functioning automatically again after a power failure and manual reset is not necessary.
- 1. Provide a time delay relay to prevent both pumps from starting simultaneously after power failure.
- I. Provide a terminal board for connection of line, pump leads and level sensors.
- J. Provide elapsed time meter wired to each motor starter, six digit, non-resettable, to indicate total running time in hours and tenths.
- K. Provide high water alarm activated by micro float switch.
- 1. Include external mounted silence pushbutton.
 - 2. Provide 115V AC, utilizing standard 40-watt incandescent bulb, vapor tight, alarm light with red globe, guard and mounting hardware.
 - a. Mount on top of panel.
 - 3. Provide 115V AC, single projector, vibrating type horn with weatherproof housing and adjustable decibel output, including mounting lugs and conduit tap.
 - 4. Horn and light to operate simultaneously under alarm conditions.
 - 5. Horn and light to be on at high level condition.
- L. Pump ammeter:
- 1. Provide a panel-mounted ammeter with a scale range greater than pump rating.
 - a. Provide an "Off-L1-L2-L3" selector switch.
 - b. Provide a "Pump 1 - Pump 2" selector switch.
 - 2. Provide General Electric or Simpson.
- M. Electrical schematic:

1. Provide a number indexed laminated electrical schematic diagram of the pump controls including terminal board connections.
 2. Permanently mount on the inside of the enclosure door.
- N. All attachment screws are to be stainless steel.
- O. Manufacturer: Switches, pushbuttons and indicator lamps to be Allen Bradley Series 800H or Square D Class 9001 SK or approved equal.
- P. Provide dry contacts wired to a terminal strip for:
- a. Pump 1-2 run (2 sets NO/1 set NC-each pump)
 - b. Pump 1-2 fail (overtemperature or overload trip)
 - c. Pump 1-2 seal fail
 - d. Phase failure
 - e. High level
 - f. Second high level (terminals only to connect second high level float directly to RTU)
 - g. Pump 1-2 H-O-A switch in auto mode
 - h. Valve vault high level alarm
- Q. Provide UPS support control logic during power failure until generator is operational.

2.12 CELLULAR MONITOR

- A. Furnish a cellular monitor capable of transmitting alarms and date over a cellular network. The monitor shall be enclosed within the control panel in a NEMA 1 enclosure. The monitor shall be powered by 120 volt AC power and have a built-in battery backup capable of keeping the RTU powered for 40 hours in case of a primary AC power failure. The monitor shall be capable of monitoring up to eight (8) digital inputs, at a minimum.
- B. The cellular monitor shall be a Mission M150 MyDro Series RTU and shall monitor the following inputs:
1. Pump 1 Run
 2. Pump 2 Run
 3. Pump 1 Alarm
 4. Pump 2 Alarm
 5. High Level Alarm
 6. Low Level Alarm
 7. Power Failure Alarm
 8. Valve Vault High Level Alarm
- C. Include omnidirectional antenna with 6' cable.
- D. Include one year of prepaid cellular service.

2.13 WIRING

- A. Pump control panel:

1. Unit to be completely factory wired except for power supply, motor, temperature switches and moisture sensor; connections; and, micro float switches.
 - a. Comply with applicable standards of National Electric Code.
 - b. Color code and number as indicated on factory wiring diagram.
 - c. Control wire to be MTW 90° C #14 AWG.
 2. Electrically ground all components to a common ground screw mounted on the removable back panel.
 3. Neatly group all wiring in plastic wire troughs except wiring from the 14 backplate to the door shall be done in separate bundled harnesses for control circuits.
 4. Provide sufficient motor lead wiring and float control wiring to make connections in the junction box to be mounted below the control panel.
- B. Level control and motor power cable:
1. Provide cable of adequate length to terminate in control panel junction box without splicing.
- C. Provide intrinsically safe relays for float system, and intrinsically safe barrier for level transducer.

PART 3 - EXECUTION

3.1 PUMP TESTING

- A. Provide the following inspections and tests on each pump before shipment from factory by the manufacturer:
1. Check impeller, motor rating and electrical connections for compliance to the customer's purchase order.
 2. Make a motor and cable insulation test for moisture content or insulation defects.
 3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
 4. Run the pump for 30 minutes submerged, a minimum of six (6') feet under water.
 5. After operational test No. 4, perform the insulation test (No. 2) again.
 6. Supply a written report stating the foregoing steps have been done with each pump at the time of shipment.
- B. Provide the following tests after installation:
1. In presence of Engineer, remove pump from structure and replace, demonstrating proper alignment and operation of mating parts.
 2. Operate pumps utilizing manual and automatic modes, demonstrating proper operational sequences including alarm conditions.
 3. Measure amperage, voltage, pumping rate and discharge pressure for each pump operating separately and for both pumps operating simultaneously.
 4. Submit six (6) copies of final test report for approval.

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DIVISION 13

SPECIAL CONSTRUCTION

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PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work included: Provide flow metering and process instrumentation devices, as indicated on the Drawings, as specified herein, and as necessary and needed to provide a complete and proper flow metering ready for operation.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

- A. It is the intention of these specifications that the complete flow metering system shall be furnished by a single equipment supplier who shall assume complete responsibility for the satisfactory operation of the systems.
 - 1. These specifications cover the intended function of the equipment, but do not necessarily cover all details necessary for a complete, operable and functional system. The supplier shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Technical services: Provide a service engineer complying with Section 01660 and the following:
 - 1. Installation, start-up and training:
 - a. Flow meter: Minimum 1 day, 1 trip.
 - 2. The minimum days specified above do not relieve the system manufacturer of providing sufficient service to place the system in satisfactory operation including providing service during the mandatory 30-day operational period prior to final acceptance.

1.3 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications, other data and shop drawings needed to prove compliance with the specified requirements.
- C. Provide Operation and Maintenance manual.

1.4 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

1.5 WARRANTY

- A. Comply with pertinent provisions of Section 01740.

PART 2 - PRODUCTS

2.1 MAGNETIC FLOW METER

- A. Provide magnetic flow meters of the number, size and location shown below for measurement of flow.

Location	Qty	Size	Range	Units	Maximum Operating Pressure
Flat Rock Pump Station	1	6"	0 – 850	GPM	150 psi

- B. Quality control:

1. Manufacturer shall be ISO9000 and ISO14001 certified.
2. All meters will be MTBF rated in strict compliance to Military Spec MIL-HDBK-217F.
3. Manufacturer must have at least 35 years of experience selling DC Pulsed magnetic flowmeters to the water/wastewater industry.
4. The manufacturer shall supply a written warranty by the manufacturer from defects in materials or workmanship for a period of at least 10 years.
5. Every unit regardless of size must be flow tested in a recognized flow testing facility that is traceable to the National Institute of Standards and Technology (NIST) or other recognized standards authority. Flow coefficient referencing for larger sizes is unacceptable.
6. The manufacturer shall provide an application performance guarantee with submittals.

- C. General:

1. The flow meters shall consist of a flanged metering tube and a transmitter which shall be mounted remotely with interconnecting cables up to 50'-0" in length.
2. The meter shall have high, low, empty pipe, rate-of-change, limit alarms, control limit time, self-diagnostics and data checking, over-range flow, under-range flow, over totalize, under totalize, range change, preset output, adjustable low flow cutoff, totalizer preset value reached, reverse flow, and converter failure alarms as standard.
3. The meter shall incorporate separate advanced noise suppression and filtering circuit specially designed for slurry applications. Auto zeroing, averaging, or dampening type algorithms in lieu of noise filtering circuitry are not acceptable.
4. A built-in rate limit function shall be available to further eliminate extraneous output dynamics.
5. The meter shall have user selectable excitation frequencies of 6Hz, 12Hz, or 24Hz to further reduce noise.
6. The magnetic flowmeter will be approved for cFMus Class I, Div II, Groups B, C, and D.
7. The meter with Polyurethane rubber liner shall be certified by NSF on NSF/ANSI Standard 61, Drinking Water System Components – Health Effects.

8. The unit will have an ambient temperature rating of at least -40°C to 60°C for remote flow tube with PFA liner, and -20°C to 60°C for remote flow tube with Polyurethane rubber or hard rubber liner and remote/combined converter.
9. Both the sensing tube and the converter will be IP67 rated (watertight).
10. Provide all equipment necessary to set up the meter in working order.
11. Provide stainless steel tag labeled to match the Contract Documents.
12. Provide 316 stainless steel grounding rings.

D. Flow tube:

1. Provide metering tube sensors of the proper sizes to measure the design flow rate of the piping and shall be noted in the instrument schedule.
2. Stainless steel tube with carbon steel flanges,
 - a. Unless noted otherwise provide ANSI B16.1 Class 150 for 24” and smaller and AWWA Class D for 30” and larger.
3. The magnetic flow meter will maintain an accuracy of $\pm 0.5\%$ of flow rate or better when mounted as close as one pipe diameter from the flange of the magmeter when located next to elbows in line sizes up to 18”. It will also have no downstream piping requirements for maintaining its published accuracy specification.
4. Vendor will also provide a written guarantee on upstream and downstream installation accuracy performance.
5. The meter shall have a standard certified flow accuracy of 0.2% of rate or better. There may be some slight deviation with no more than an additional $\pm 0.5\%$ of reading permitted.
6. Each flowmeter will be flow lab calibrated in the manufacturer’s flow lab. The manufacturer will flow lab calibrate all meters twice at 0%, 50% and 100% of flow for a total of 6 flow point calibrations. The dual flow calibration technique will confirm the results of the first flow test and ensure that the meter will exhibit a typical installed accuracy of $\pm 0.2\%$ or better of actual flow rate.
7. The meter shall be supplied with PFA liner that is mechanically retained for 3” meter size or over, Polyurethane rubber or Hard rubber liner to allow full vacuum service (-15 psig).
8. The electrodes shall be 316L stainless steel or Hastelloy C, electrolytic polished with non-stick self-cleaning finish.
9. Flanges will be carbon steel as standard up to and including 18”.
10. The meter shall be capable of bi-directional flow without requiring any re-zeroing.
11. The detectors neck (connection between coils and wiring plate) shall be epoxy sealed to prevent moisture or water from entering the body of the detector.
12. All sensing tubes (regardless of size) must be stamped with the original flow lab calibration factor to allow “dry calibration” and interchangeability between all flow converters and sensing tubes to original accuracy.
13. All meters must have 40 years or higher MTBF rated detector.
14. All meters must be IP67 and NEMA 4X watertight as standard or optionally, IP68 and NEMA6P and submersible to 15m in water.

E. Converter:

1. Three stage microprocessor controller mounted remotely unless integrally mounted as indicated on the drawings.
2. The meter shall have its own “Built-in” field re-verification tool – which can re-verify and recalibrate the converter to the original flow lab calibration without the need of other devices.

3. The converter shall have non invasive 3 button infrared display that configures using a self-prompting menu without exposing the converter internals to the surrounding atmosphere.
 4. The magnetic flowmeter converter shall be microprocessor based, have “built in” diagnostics, and retain program configuration in memory for at least 10 years.
 5. The meter shall work on any conductive fluid without re-calibration for different fluid types.
 6. The meter shall be capable of switching between 4 different ranges and forward/reverse 2 range switching.
 7. The meter shall have a full function dot-matrix 128 X 128 analog/digital LCD display backlit for night viewing that is electrically 360 degrees rotatable in 90 degree increments using the meter’s software.
 8. The electronic circuit boards will be conformal coated for protection from moisture
 9. All electronic circuit boards will use Surface Mount Technology to provide resistance to vibration.
 10. The meter shall incorporate high input impedance circuitry and have an input impedance of 50 meg ohm or greater thus negating the need for external electrode cleaning devices and to eliminate errors caused by changing process conductivity.
 11. The meter must be capable of normal operation during abnormal voltage conditions from a minimum of 80 volts during low voltage conditions or a maximum of 264 volts during over voltage conditions.
 12. The converter housing must be NEMA 4X fireproof and made of corrosion resistance anodized aluminum with Acrylic resin coating.
 13. The converter will be supplied with surge protection in the power supply and the signal output circuit.
 14. Provide transmitter as shown on the drawings for wall or pipe stand mounting.
 15. Provide necessary cable to connect primary flow element to the flow transmitter.
- F. Outputs:
1. One 4-20mA analog with HART.
 2. Capable of two digital outputs (for alarms, batching, and pulse applications).
- G. Inputs:
1. One digital input (20 – 30 Volts dc) for range switching, totalizer control, fixed value outputs, zero adjustment.
- H. The magnetic flowmeter shall be the LF654 series flow tube and the LF620 series converter as manufactured by Toshiba, or equal by the Engineer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 LOCATION

- A. Locate all instrumentation, piping, wiring, etc. as indicated.
- B. Securely anchor all equipment to floors or walls.

3.3 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this Section in strict accordance with the original design and the manufacturer's recommended installation procedures as approved by the Engineer, anchoring all components firmly into position for long life under hard use.
- C. Perform all wiring in compliance with Section 16400.

3.4 FIELD WIRING

- A. The instrumentation supplier shall be responsible for completing the connections to all instruments.
- B. Wiring materials, methods of installation, etc. shall conform to Section 16400.

3.5 FIELD CALIBRATION

- A. Calibrate all instrumentation in the presence of the Engineer with the range and accuracy specified herein.
- B. Provide written report detailing progress of system start-up.
 - 1. Include specific tabulations of devices on which start-up has been completed.

3.6 MEASUREMENT AND PAYMENT

- A. No separate measurement or direct payment will be made for the work under this Section and all costs for same shall be included in the price bid for the item to which it pertains.

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DIVISION 15
MECHANICAL

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PART 1 - GENERAL**1.1 SECTION INCLUDES**

- A. Hangers and supports for sanitary sewer force main.

1.2 RELATED SECTIONS

- A. None.

1.3 REFERENCES

- A. American Society of Mechanical Engineers (ASME):
 - 1. B31.1 - Power Piping (SI Edition).
 - 2. B31.3 - Chemical Plant and Petroleum Refinery Piping.
 - 3. B31.9 - Building Services Piping.
- B. ASTM International (ASTM):
 - 1. A36 - Standard Specification for Carbon Structural Steel.
 - 2. A47 - Standard Specification for Ferritic Malleable Iron Castings.
 - 3. A48 - Standard Specification for Gray Iron Castings.
 - 4. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 5. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 6. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 7. A387 - Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum.
 - 8. A515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate-and Higher-Temperature Service.
 - 9. A536 - Standard Specification for Ductile Iron Castings.
 - 10. A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
 - 11. A668 - Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
 - 12. A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved

Formability.

13. B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- C. Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) Standard Practices:
1. SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture.
 2. SP-69 Pipe Hangers and Supports - Selection and Application.
 3. SP-77 Guidelines for Pipe Support Contractual Relationships.
 4. SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices.
 5. SP-90 Guidelines on Terminology for Pipe Hangers and Supports.
 6. SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

1.4 SYSTEM DESCRIPTION

- A. General Requirements:
1. Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01340.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
 2. Load capacity and sizing schedules specific to Project.
 3. Installation methods.
- C. Certifications:
1. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.
- D. Shop Drawings:
1. Bases, hangers and supports.
 2. Connections to bridge structure.

3. Structural assemblies.
- E. Closeout Submittals:
1. Warranty: Warranty documents.
 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
1. Manufacturing facilities shall be registered to ISO 9001.2000 and assessed to ISO 9000.2000 standard. A copy of the current certificate shall be available upon request.
- B. Installer Qualifications:
1. Utilize an installer experienced in performing work of this section who is experienced in installation of work similar to that required for this project and per the minimum requirements of MSS SP-89.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights, Owner may have under Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Anvil Intl., Inc.; 110 Corporate Dr. Suite 10, Portsmouth, NH 03802. ASD. Tel: (603) 422-8000. Fax: (603) 422-8033.
- B. Requests for substitutions will be considered in accordance with provisions of the applicable specification section.

2.2 MANUFACTURED UNITS - APPLICATION REQUIREMENTS

- A. Fabricate hangers, supports and sway braces to comply with building codes.
- B. Do not use installed hangers for rigging or erection purposes.
- C. Materials available by product type. Provide materials to comply with location and application requirements unless noted otherwise on drawings and schedules.
 - 1. Pipe rings - Malleable iron, carbon steel.
 - 2. Clevis - Carbon steel.
 - 3. Steel pipe clamps - Carbon steel, alloy, stainless steel.
 - 4. Socket clamps - Carbon steel.
 - 5. Beam clamps - Malleable/ductile iron, hardened steel, carbon steel, forged steel.
 - 6. Structural attachments - Carbon steel, malleable iron.
 - 7. Ceiling plates/ceiling flanges - Plastic, cast iron, malleable iron.
 - 8. Concrete inserts and attachments – Malleable iron, carbon steel; stainless steel body, fiberglass bars, polypropylene disc (iron cross design).
 - 9. Rod attachments - Carbon steel, malleable iron, forged steel.
 - 10. Pipe supports - Carbon steel, cast iron.
 - 11. Pipe shields and saddles - Carbon steel, alloy steel, stainless steel.
 - 12. Pipe rolls - Cast iron, carbon steel.
 - 13. Guides - Carbon steel; slides, carbon steel with PTFE slide plates.
 - 14. Engineered hangers - Carbon steel, stainless steel, chrome molybdenum steel.
- D. Finishes: Provide finishes to comply with location and application requirements unless noted otherwise on drawings and schedules.
 - 1. Electro-plating galvanizing process per ASTM B633.
 - 2. Hot Dipped galvanizing process per ASTM A153.
 - 3. Epoxy paint.
 - 4. Zinc-rich paint.
 - 5. Standard primer shall meet Fed Spec TT-P-636.

HANGERS AND SUPPORTS

- E. Application Requirements: Use components for intended service conditions only. Comply with service requirements below unless noted otherwise on drawings and schedules.
 - 1. Exterior utility and mechanical yard areas shall use piping that is hot dip galvanized.
 - 2. Interior piping to be black iron.
 - 3. Hydronics and plumbing piping hangers shall be manufactured from carbon steel, cast malleable iron or cast iron.
 - 4. Steam piping hangers shall be manufactured from Chrome Molybdenum steel.
 - 5. Submerged piping hangers shall be manufactured from 316 stainless steel.

2.3 MANUFACTURED UNITS - MSS-SP-69 TYPES NOTED FOR PRODUCTS THAT ARE IN COMPLIANCE

- A. Clevis: Fig. Numbers.
 - 1. 590 Adjustable Clevis for Ductile or Cast Iron Pipe, MSS-SP-69 (Type 1).
- B. Concrete Inserts and Attachments: Fig. Numbers.
 - 1. 52 Concrete Rod Attachment Plate.
- C. Hanger Rod and Rod Attachments: Fig. Numbers.
 - 1. 140 Machine Threaded Rod. Threaded both ends with right-hand threads.

2.4 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- A. Provide templates to ensure accurate location of anchor bolts.
- B. Concrete Anchors: Shall be the Hilti HVA Adhesive Anchor System or approved Equal. Tensile bond strength shall be 28,720 lbs minimum.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 HANGER INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Adjust hangers to equalize load.

3.4 FINAL ADJUSTMENT

- A. Adjust Hangers and Supports:
 - 1. Ensure that rod is vertical under operating conditions.
 - 2. Equalize loads.
- B. Adjustable Clevis:
 - 1. Tighten hanger load nut securely to ensure proper hanger performance.
 - 2. Tighten upper nut after adjustment.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 16
ELECTRICAL

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STANDBY ELECTRIC POWER SYSTEM**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work included: Provide an engine driven standby electric generator system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
1. Diesel/Natural Gas engines.
 2. Engine instruments and controls.
 3. Alternator.
 4. Control panel.
 5. Exhaust silencer.
 6. Weather-protective, sound attenuated, non- walk-in enclosure.
 7. Associated accessories and other items and services required to complete the system whether particularly mentioned or not.
 8. Fuel tank (for diesel gens-filled on site).
 9. Automatic transfer switch in accordance with 16400.
- B. Related work:
1. Section 16400 – Electrical.
- C. Applicable Standards
1. NFPA 70: National Electrical Code
 2. NFPA 110: Standard for Emergency and Standby Power Systems
 3. UL508: Standard for Industrial Control Equipment
 4. UL2200: Standard for Stationary Engine Generator Assemblies
 5. UL142: Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids
 6. CSA C22.2 No. 14: Industrial Control Equipment
 7. CSA C282: Emergency Electrical Power Supply for Buildings
 8. CSA C22.2 No. 100: Motors and Generators
 9. EN61000-6: Electromagnetic Compatibility
 10. EN55011: Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-frequency Equipment
 11. FCC Part 15 - Radio Frequency Devices - Subpart B-Unintentional Radiators
 12. ISO 8528: Reciprocating Internal Combustion Engine Driven Alternating Current Generating Sets
 13. IEC 61000: Electromagnetic Compatibility

STANDBY ELECTRIC POWER SYSTEM**1.2 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Generator shall be manufactured by Caterpillar or approved equal. Equal products of other manufacturers conforming to these specifications may be provided as outlined in the instructions to bidders and as approved by the Engineer.
- C. The system shall be factory assembled and tested by the manufacturer of the generating system or be assembled and tested by an authorized representative of the manufacturer using an engine or generator made by the system manufacturer so that the system will have one source of supply and responsibility. The performance of the generating set series shall be certified by an independent testing laboratory as to the set's full power rating, stability and voltage and frequency regulation.
- E. The manufacturer of the generating system shall maintain a thoroughly stocked authorized parts and service facility within 100 miles of the installation.
- F. Technical services:
 - 1. Provide a service engineer to complete the initial start-up, make proper and complete adjustments of all adjustable devices, load switches, etc., and to also verify and approve all connections prior to any test operation of said equipment.
 - a. One 2-day trip.
 - 2. Confirmation in writing by the manufacturer's authorized representative of said services shall be submitted to Engineer.

1.3 SUBMITTALS

- A. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
 - 4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
- C. Upon completion of the work of this Section, and as a condition of its acceptance, deliver to the Engineer an operation and maintenance manual compiled in accordance with the provisions of Section 01340 of these Specifications.

STANDBY ELECTRIC POWER SYSTEM**1.4 WARRANTY**

- A. Provide a standard two-year warranty on all labor, materials, and equipment of the generating system.
1. Upon placing the generator in service provide a 30-day initial operating period.
 2. The warranty will begin upon successful completion of the initial operating period.

1.5 RULES AND PERMITS

- A. The entire installation shall be in accordance South Carolina Department of Health and Environmental Control (SCDHEC) Regulations, NFPA, and all local codes.
- B. The Engineer will obtain all permits and inspections required by local or state laws.
- C. Furnish the Owner with certificate of inspection and final approval from all authorities having jurisdiction.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. Provide new and current system equipment consisting of:
1. Engine driven electric generating set to provide standby power.
 2. Engine start-stop control system mounted on the generating set.
 3. Mounted accessories as specified.

2.2 SYSTEM

- A. Provide generators rated for continuous standby service with ratings as noted below. Continuous standby service constitutes full load operation without interruption for a minimum period of 14 days.

Pump Station	Min. Size	Voltage (3 ph)	NG/Diesel
Flat Rock	125 KW, 200 KVA	277/480V	Diesel

1. For diesel engines, provide fuel filter and fuel transfer pump at engine.
 2. For NG engines, provide necessary gas regulators at engine.
- B. Provide water-cooled with mounted radiator, fan and water pump.
- C. Provide intake and exhaust valves made of heat resisting alloy steel with exhaust valve seat inserts.
- D. Supply full pressure lubrication by lube oil pumps.

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- E. Provide air cleaner, fuel and oil filters with replaceable elements, and lube oil cooler.
- F. Govern engine speed by electronic governor to maintain the alternator frequency within one (1) hertz from no load to full load alternator output.
- G. Provide remote, 2-wire starting by a solenoid shift, electric starter.
- H. Directly connect the starter to the engine flywheel housing.

2.3 ALTERNATOR

- A. Provide brushless, 4-pole, revolving field design with temperature compensated solid-state voltage regulator and rotating rectifier exciter system.
 - 1. Provide rotor driven through a semi-flexible driving flange to ensure permanent alignment.
 - 2. Provide alternator with frequency regulation not exceeding 3 Hz from no load to rated load.
 - 3. Provide alternator with voltage regulation within +/-2% of rated voltage, from no load to full rated load.
 - 4. Provide alternator with recovery to stable operation occurring within 2 seconds.
 - a. Stable operation is defined as operation with terminal voltage remaining constant +/-1% of rated voltage.
 - 5. Provide alternator with a rheostat providing a minimum of +/-5% voltage adjustment from rated value.
 - 6. Provide alternator with temperature rise within NEMA MG1-22 definition.
 - 7. Provide alternator utilizing 3-phase filtered sensing voltage regulation and having an independent power supply for the excitation system (i.e. permanent magnet generator, Auxiliary Winding, Regulator Exciter Principle (AREP) and series boost type excitation system).
 - 8. Provide alternator with a sub-transient reactance of 0.12 per unit, or lower, based on steady-state rating.
 - 9. Provide alternator with Class H insulation.
 - 10. Provide alternator producing a voltage waveform for proper operation of variable frequency PWM drives that produce line to neutral total harmonic distortion to 5% maximum with a maximum 3% distortion in any single harmonic order.
 - 11. Equip alternator with a 120 volt, single-phase space heater.

2.4 CONTROLS

- A. Provide a fully solid-state, microprocessor based, generator control panel wired, tested and shock mounted on the generating set by the manufacturer of the generating plant.
- B. Provide the following functionality integral to the control panel:
 - 1. A minimum 64 x 240 pixel (28mm x 100mm) white backlight graphical display with text based alarm/event descriptions.

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2. A minimum of 3-line data display.
 3. Audible horn for alarm and shutdown with horn silence switch.
 4. Standard ISO labeling
 5. Multiple language capability
 6. Remote start/stop control
 7. Local run/off/auto control integral to system microprocessor
 8. Cooldown timer
 9. Speed adjust
 10. Lamp test
 11. Push button emergency stop button
 12. Voltage adjust
 13. Voltage regulator V/Hz slope – adjustable
 14. Power Factor Control for paralleling units
 15. Password protected system programming
- C. Provide the panel with the following Digital indications:
1. AC voltage, 3-phase (L-L and L-N)
 2. AC amps (3-phase and total)
 3. KW (total and per phase)
 4. KVA (total)
 5. KVAR (total)
 6. KWHR (total)
 7. KVARHR (total)
 8. PF (average total and 3-phase)
 9. % of rated (total)
 10. Frequency
 11. DC voltage
 12. System diagnostic
 13. Excitation voltage
 14. Excitation current
 15. Engine oil pressure
 16. Engine oil temperature
 17. Engine coolant temperature
 18. Engine RPM
 19. Battery volts
 20. Engine hours
 21. Engine crank attempt counter
 22. Engine successful start counter
 23. Service maintenance interval
 24. Real time clock
 25. Oil filter differential pressure
 26. Fuel temperature
 27. Fuel pressure
 28. Fuel filter differential pressure
 29. Fuel consumption rate
 30. Total fuel consumed

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31. Engine intake manifold temperature
 32. Engine intake manifold pressure
 33. Engine crankcase pressure
 34. Air filter differential pressure
 35. Boost pressure
 36. Oil filter differential pressure
- D. Provide alarm indication and subsequent shutdown for the following conditions (Store in the control panel the first and last occurrences of all alarms and shutdowns with a time, date, and engine hour stamp):
1. Low oil pressure alarm/shutdown
 2. High coolant temperature alarm/shutdown
 3. Loss of coolant shutdown
 4. Overspeed shutdown
 5. Overcrank shutdown
 6. High intake manifold temperature alarm/shutdown
 7. High exhaust manifold temperature alarm/shutdown
 8. High crankcase pressure alarm/shutdown
 9. High air inlet temperature alarm/shutdown
 10. Emergency stop depressed shutdown
 11. Low coolant temperature alarm
 12. Low battery voltage alarm
 13. High battery voltage alarm
 14. Control switch not in auto position alarm
 15. Battery charger failure alarm
 16. Generator over voltage
 17. Generator under voltage
 18. Generator over frequency
 19. Generator under frequency
 20. Generator reverse power
 21. Generator overcurrent
 22. Loss of excitation alarm/shutdown
 23. Instantaneous over excitation alarm/shutdown
 24. Time over excitation alarm/shutdown
 25. Rotating diode failure
 26. Loss of sensing
 27. Loss of PMG
- E. Provide the ability to accept six (6) programmable digital input signals.
- F. Provide accessible through a single electronic service tool all engine, voltage regulator, control panel and accessory units. Provide the following maintenance functionality:
1. Engine running hours display
 2. Service maintenance interval (running hours or calendar days)
 3. Engine crank attempt counter

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4. Engine successful starts counter
 5. 20 events are stored in control panel memory
 6. Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 14 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points:
 - a. Day of week
 - b. Time of day to start
 - c. Duration of cycle
- G. Provide Modbus RTU remote communications as standard via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.
- H. Provide Remote Monitoring Software with the following functionality
1. Access to all date and events on generator set communications network
 2. Remote control capability for the generator set
 3. Ability to monitor up to 12 generator sets
 4. Ability to communicate via Modbus RTU or remote modem
- I. Provide an annunciator to meet the requirements of NFPA 110, Level 1.
1. Network directly to the generator set control
 2. Include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton
 3. Provide the following individual light indications for protection and diagnostics:
 - a. Overcrank
 - b. Low coolant temperature
 - c. High coolant temperature warning
 - d. High coolant temperature shutdown
 - e. Low oil pressure warning
 - f. Low oil pressure shutdown
 - g. Overspeed
 - h. Low coolant level
 - i. EPS supplying load
 - j. Control switch not in auto
 - k. High battery voltage
 - l. Low battery voltage
 - m. Battery charger AC failure
 - n. Emergency stop
 - o. Spare
 - p. Spare
- J. Equip unit with factory mounted terminal blocks and strips for all power, signal and control wiring connections.
- K. Provide dry contacts for generator running, common alarm (to include not-in-auto) and low fuel.

STANDBY ELECTRIC POWER SYSTEM**2.5 GENERATING SET MOUNTING**

- A. Equip generator set with vibration isolators and mount on a welded steel base that will provide suitable mounting to any level surface.
- B. Equip unit with a reinforced sheet steel, minimum 16 gauge, sound attenuating, non-walk-in weather-protective housing.
 - 1. Reinforce to be vibration-free in the operating mode.
 - 2. Provide housing with lockable removable panels on each side of the housing to access generator with a hinged door to access instrument panel.
 - 3. Provide housing complete with accessories listed below, be rust treated and painted standard color of manufacturer.
 - 4. Provide peaked roof for drainage.
 - 5. Provide corrosion resistant fasteners.
 - 6. Extend coolant and oil drain line connections outside of enclosure.
 - 7. Insulate enclosure to limit unit noise to 74dB at 23'.
 - 8. Mount enclosure over an integral welded steel base fuel tank complete with all fuel fittings, level indicator, vent, exterior lockable fill port and drains, etc., and necessary galvanized steel support framing so that the weight of the generator is not supported by the tank. Size tank to run the generator at full load for a minimum of 1 days.
 - a. Enclose tank in a welded steel secondary containment vessel having an audible spill alarm system powered from the generator battery system and alarmed on the generator control panel.
 - b. All welds, cuts, openings, etc., in the steel material, shall be cold galvanized as a minimum after fabrication.
 - 9. Provide tank underwriter's labeled (UL).

2.6 ACCESSORIES

- A. Provide the plant with all accessories needed for proper operation to include, but not be limited to:
 - 1. A critical type silencer mounted inside enclosure.
 - 2. Stainless steel flexible exhaust connection.
 - 3. Sufficient exhaust piping of aluminized schedule 40 steel pipe and fittings, including end rain cap.
 - 4. Lace-up type insulation blankets to completely insulate muffler and interior
 - 5. Provide a 10-amp, automatic "float" type battery charger to maintain the batteries at normal capacity.
 - a. Provide 120V input with 12 VDC output to battery(s)
 - b. Provide cables, battery rack, AC compensation, current limit, DC ammeter to show battery voltage, equalizing switch, fused AC input and DC output, complete isolation of AC input and DC output.
 - c. Design as not to discharge the battery in event of failure.

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- 6. Provide engine mounted, thermostatically controlled, immersion type heater to ensure a minimum coolant temperature of 120° F in a minimum ambient temperature of -15° F.
 - a. Operate on a 120 volt, single-phase AC power.
- 7. Engine Block Heaters sized per manufacturer’s requirements. Any required increase of feeder circuits, different from that as shown on drawings, is the responsibility of the Contractor to provide and install at no additional cost to the Owner.
- B. Radiator coolant shall be all weather, all season, environment friendly 50% solution antifreeze.
- C. Provide adequate fuel to fill tank
- D. Overcurrent Protection:
 - 1. Furnish the engine/generator set with overcurrent output protection per the latest edition of NEC 445-4 at the engine/generator set.

2.7 IDENTIFYING SIGNS

- A. Provide identifying signs as shown on drawings and as specified herein for proper installation and in accordance with latest edition of National Electrical Code.
 - 1. Sign design is based on use of standard products manufactured by Seton Name Plate Company of New Haven, CT and is named to establish standards of quality.
 - 2. Provide the products upon which design is based or provide equal products of another manufacturer approved in advance by the Engineer.
 - 3. Provide sign material as 60 mils. thick press polished high performance vinyl plastic.
 - 4. Provide sunlight fade resistance.
 - 5. Overcoat with Tedlar.
 - 6. Provide rounded corners.
 - 7. Provide 14" x 10" sign.
 - 8. Main heading to read: "CAUTION", white letters on red background with black border. Subtitle to have black letters on white background.
 - 9. Mount with stainless steel screws at location as directed in field.
 - 10. Sign schedule:

AREA	SIGN SUBTITLE	NO. SIGNS PER AREA
Service Entrance	Standby Emergency Generator Onsite	1
System Ground Connection Point	Normal Service and Standby Emergency Generator Connected to Grounding Electrode	1

- 11. Install sign in strict accordance with the manufacturer's recommendations as approved by the Engineer, using only the approved mounting materials, and locating all components firmly into position, level and plumb.

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12. Locate where directed by the Engineer.
13. Mounting hardware to be Type 316 stainless steel.
14. Where adequate sign supports are not available, fabricate sign stand using Type 316 stainless steel channel and fittings.

PART 3 - EXECUTION**3.1 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Install the work of this Section in strict accordance with the manufacturer's recommendations as approved by the Engineer.
- C. Put all components through at least five complete cycles of operation, adjust as required, and verify that the complete system functions at optimum operating level.

3.3 TESTING AND INSPECTION

- A. Provide personnel and equipment, make required tests, and secure required approvals from the Engineer and governmental agencies having jurisdiction.
- B. Make written notice to the Engineer adequately in advance of each of the following stages of construction:
 1. In the underground condition prior to placing concrete floor slab, when all associated electrical work is in place.
 2. When all rough-in is complete, but not covered.
 3. At completion of the work of this Section.
- C. An operational test of the standby power system shall be conducted by a representative of the manufacturer of this equipment in the presence of the Engineer and the operating personnel. It shall be demonstrated during these tests that the voltage sensitive and time delay devices perform at their specified settings.
- D. Provide 2 hour load bank test for each generator.
- E. When material and/or workmanship are found to not comply with the specified requirements, within three days after receipt of notice of such non-compliance remove the non-complying

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items from the job site and replace them with items complying with the specified requirements, all at no additional cost to the Owner.

3.4 PROJECT COMPLETION

- A. Upon completion of the work of this Section, thoroughly clean all exposed portions of the system installation, removing all traces of soil, labels, grease, oil and other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned.
- B. Thoroughly indoctrinate the Owner's operation and maintenance personnel in the contents of the operations and maintenance manual required to be submitted under Part 1.3 of this Section of these Specifications.

3.5 COMPUTATIONS

- A. The pump station has 2 pumps as noted below which do not start simultaneously:

Pump Station	Motor Load	Motor Control	Residual Load
Flat Rock	2 @ 50 HP	RVSS	15 kW

- B. Base computations on reduced-voltage solid-state starters with current limiting setting of 225%.
- C. The manufacturer shall submit computations indicating that the unit furnished will satisfactorily operate with equipment to be connected as stated above.
- D. Maximum voltage drop of 20%.

3.6 MEASUREMENT AND PAYMENT

- A. No separate measurement or direct payment will be made for this work and all costs for same shall be included in the price bid for the work to which it pertains.

END OF SECTION

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PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work included: Provide a complete electrical system as indicated on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
1. Service Entrance Disconnect
 2. Main breaker.
 2. Feeder system, in conduit.
 3. Mini-Powerzone (MPZ)
 4. Branch circuit wiring, in conduit, for lighting, receptacles, junction boxes and motors.
 5. Lighting fixtures.
 6. Wiring system, in conduit, for equipment and controls provided under other Sections of these Specifications including, but not necessarily limited to, Equipment and Mechanical Sections.
 7. Transient voltage surge suppressors.
 8. Other items and services required to complete the systems whether particularly mentioned or not.
- B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 ABBREVIATIONS

A	Ampere (Amps)	MCA	Minimum Circuit Amps
AFF	Above Finished Floor	MCC	Motor Control Center
AFG	Above Finished Grade	MCM	1000 Circular Mills (KCMIL)
AHJ	Local Authority Having Jurisdiction	MOCP	Maximum Over-current Protection
AIC	Amps Interrupting Current	N	Neutral
AFCI	Arc-Fault Circuit Interrupter	NEC	2002 National Electrical Code
ANSI	The American National Standards Institute	NEMA	National Electrical Manufacturers Association
BF	Ballast Factor	NFPA	National Fire Protection Association
Bkr.	Breaker	NIC	Not in Contract
C	Conduit	OSHA	Occupational Safety and Health Act
Ckt.	Circuit	PF	Power Factor
CRI	Color Rendering Index	PLC	Programmable Logic Controller
CU	Copper Conductor	PVC	Polyvinyl Chloride Conduit
DETD	Dual Element Time Delay Fuse	RGSC	Rigid Galvanized Steel Conduit
Disc.	Disconnect	RMS	Root Mean Square
Dn	Down	RTU	Remote Terminal Unit
EMT	Electrical Metallic Tubing	SCADA	Supervisory Control and Data Acquisition
FLA	Full Load Amps	SCCR	Short-Circuit Current Rating
FPM	Fuse per Manufacturer Requirements	SPD	Surge Suppression Device
FS	Federal Specifications	Sym	Symmetrical
G /GND	Ground	THD	Total Harmonic Distortion
GFCI	Ground-Fault Circuit Interrupter	TSP	Twisted Shielded Pair
GFP	Ground-Fault Protection	TST	Twisted Shielded Triplet
HD	Heavy Duty	TVSS	Transient Voltage Surge Suppressor

HP	Horsepower	UL	Underwriters Laboratories Inc.
IBC	International Building Code	UON	Unless Otherwise Noted
IEEE	Institute of Electrical & Electronics Engineers	V	Volts
IMC	Intermediate Metallic Conduit	W	Watts
KVA	Kilovolt-Amps	WFC	Watertight Flexible Conduit
KW	Kilo Watt	WG	Wire Guard
KA	Kilo Amps	XFMR	Transformer
LCCF	Lamp Current Crest Factor		

1.3 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section. These shall include, but not be limited to, an electrical supervisor who is a licensed master electrician, a field foreman with a minimum journeyman electrician's license and adequate electricians and helpers.
- B. Without additional cost to the Owner, provide such other labor and materials required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. Electrical subcontractor shall furnish a 100 percent performance bond and a 100 percent payment bond to the Contractor as security for the faithful performance of this Section, as security for the payment of all persons performing labor on the project under this Section and furnishing materials in connection with this Section. The performance bond and payment bond shall be in separate instruments.

1.4 SUBMITTALS

- A. Comply with pertinent provisions of Section 01340.
- B. Product data: Within 30 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications, other data and shop drawings needed to prove compliance with the specified requirements. Provide the following approval drawings:
 - a. Disconnect switches
 - b. Main breaker.
 - c. Mini-Powerzone
 - d. Wiring devices and cover plates.
 - e. Conduit and fittings.
 - f. Conductors.
 - g. Lighting fixtures.
 - h. Transient Voltage Surge Suppressor.
 - i. Special systems.
 - 3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
- C. Manual: Upon completion of this portion of the Work and as a condition of its acceptance, provide operation and maintenance manuals in accordance with the provisions of Section 01650 of these Specifications. Include within each manual:
 - 1. Copy of the approved Record Documents for this portion of the Work.
 - 2. Copies of all warranties and guaranties.

1.5 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01640.

1.6 WARRANTY

- A. Provide standard one (1) year warranty on all labor and materials.
- B. Provide a five (5) year warranty on LED lighting fixtures.
- C. Provide minimum five (5) year warranty on Surge Protection Devices, incorporating unlimited replacements of suppressor parts if destroyed by transients during the warranty period.
- D. Comply with Section 01650.

1.7 RULES AND PERMITS

- A. The entire installation shall be in accordance with the latest edition of the NEC, OSHA, and all local codes.
- B. Apply and pay for all permits and inspections required by local or state laws.
- C. Furnish the Owner with certificate of inspection and final approval from all authorities having jurisdiction.

1.8 DRAWINGS

- A. The drawings and specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. The drawings are diagrammatic and are to be followed as closely as the construction will permit.
- B. The drawings show the general location of outlets, conduits and circuit arrangement. Because of the small scale of the drawings, it is not possible to indicate all of the detail involved. The Contractor shall carefully investigate the structural and finish conditions affecting all his Work and shall arrange such work accordingly, furnishing such fittings, junction boxes and accessories as may be required to meet such conditions.

1.9 ELECTRICAL SERVICE

- A. From the utility company, establish requirements for transformer pad(s), metering, connections, etc., and make provisions for them; providing and installing all lugs, connectors, grounding, etc., required for a complete installation.
 - 1. Coordinate work with both the electric utility company and the Owner, and schedule the installation of the service in accordance with the construction schedule such that there will be no delays in equipment startup and placing the facilities in operation.
- B. Local Utility Company is Blue Ridge Electric.

1.10 ELECTRICAL OUTAGE

- A. Coordinate all outages with the Owner, 72 hours prior. Schedule all outages such that they will not interfere with normal plant operation and that there will be no delays in equipment startup and placing the facilities in operation.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide only materials that are new, of the type and quality specified. Where Underwriters' Laboratories, Inc. have established standards for such materials, provide only materials bearing the UL label. Materials called for are to be considered as standard that, however, implies no right on the part of the Contractor to substitute other materials and methods without written authority from the Engineer.
- B. Temporary power:

1. In addition to providing temporary power as described in Section 01500 of these Specifications, provide and pay the costs for installing permanent electrical meter or meters.
 2. When all equipment is in place and connected, and the Engineer determines the project is ready for final checkout, arrange to have the permanent metering installed in the Owner's name. At this point, the Owner will be responsible for all charges.
- C. Where any material or operation is specified by reference to published specifications or standards or the specifications or standards of any other organization; the referenced specification or standard shall be as much a part of this Section as if quoted in full herein.

2.2 RACEWAYS

- A. Applicable Standards:
1. ANSI C80.1: Rigid Steel Conduits, Zinc-Coated.
 2. ANSI C80.3: Electrical Metallic Tubing, Zinc Coated.
 3. ANSI C80.5: Rigid Aluminum Conduits.
 4. ANSI C80.6: Intermediate Metallic Conduits.
 5. ANSI/NEMA FB1: Fittings and Supports for Conduit and Cable Assemblies.
 6. UL 6: Rigid Steel Conduit – Zinc Coated.
 7. UL 651-2002: Schedule 40 PVC and schedule 80 Rigid PVC Conduit.
 8. UL 514B: Flexible conduit fittings.
 9. NEMA RN 1: Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 10. NEMA FB 1: Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
 11. ASTM F512: Polyvinyl Chloride (PVC) Conduit.
 12. ASTM D870: Standard Practice for Testing Water Resistance of Coatings Using Water Immersion.
 13. ASTM D1151: Standard Practice for Effect of Moisture and Temperature on Adhesive Bonds.
 14. FS WW-C 581E: Federal Specification for Rigid Galvanized Steel Conduit.
 15. FS-WW-C-563A: Federal Specification for Electrical Metallic Tubing.
 16. FS-WW-C-540C: Federal Specification for Rigid Aluminum Conduit.
 17. FS WW-C 566: Federal Specification for Flexible Metal Conduit.
- B. Acceptable Manufacturers:
1. Wheatland.
 2. Allied Tube.
 3. Perma-Cote; Division of Robroy.
 4. Ocal.
 5. Carlon.
- C. Provide conduit and fittings conforming to the above standards.
- D. Rigid aluminum conduit:
1. Provide thread type fittings and conduit bodies with matching material.
 2. Provide standard electric conduit couplings
 - a. Do not use pipe couplings or sleeves.
 3. Provide full weight galvanized fittings.
 4. Do not imbed aluminum conduit concrete containing chlorides, unwashed beach sand, sea water, or coral bearing aggregates.
 5. Isolate from other metals with heat shrink tubing (Raychem or equal) or plastic-coated hangars.
 6. Use strap wrenches for tightening aluminum conduit.
 - a. Do not use Pipe wrenches, channel locks, chain wrenches, pliers, etc.
 7. Clean and coat all threads on aluminum conduit and fittings with "No-Oxide" compound before using.
 8. Completely cover Aluminum conduit installed in concrete or below grade s with two(2) coats of bitumastic paint.
 9. Terminate aluminum conduit entering manholes and below grade pullboxes with grounding type bushings and connected to a ¾" x 10" copperclad rod with a #6 bare copper wire.
 10. All risers from underground, concrete pads, floors, etc.

- a. Provide heat shrink tubing (Raychem or equal) from a point 1 foot-0-inch below bottom of slab or grade to a point not less than 6 inches above grade or surface of slab.
- E. Provide hot-dipped, galvanized, watertight type fittings for liquid tight flexible conduit as manufactured by O-Z/Gedney or approved equal.
- F. Conduit/Cable supports – properties:
 - 1. Provide 316 stainless steel supports for all exposed metallic conduit as manufactured by Unistrut or approved equal.
- G. All conduits to conform to the following specifications unless otherwise noted on OJRSA standard drawings and specifications:
 - 1. Installations under concrete slab: Schedule 40 PVC
 - 2. Exposed outdoor locations: Rigid aluminum conduit.
 - 3. Interior locations: Rigid aluminum conduit.
 - 4. Installations in concrete-encased duct banks: Schedule 40 PVC.
 - 5. Installations underground exposed to earth: Rigid aluminum conduit. (with PVC or bitumastic coating)

2.3 CONDUCTORS

- A. Applicable standards:
 - 1. NEMA WC 3: Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - 2. NEMA WC 5: Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - 3. UL 44 – 2002: Rubber-Insulated Wires and Cables.
 - 4. UL 83 – 1999: Thermoplastic-Insulated Wires and Cables.
 - 5. UL 854 – 2002: Service Entrance Cables.
- B. Acceptable Manufacturers:
 - 1. Okonite.
 - 2. Pirelli.
 - 3. Southwire.
 - 4. Superior Essex.
 - 5. Belden.
- C. Conductor types:
 - 1. Low voltage conductors (0 to 600V):
 - a. For secondary service entrance, feeders, underground, under floor, in damp or wet locations, and to any process associated equipment provide copper, 600V, 75°C, Type XHHW.
 - b. For all other low voltage conductors, provide copper, 600V, 75°C, Type THWN.
 - c. Provide stranded conductors for sizes #12 and larger.
 - d. Provide same type of equipment grounding conductors as specified above.
 - e. Provide all branch circuit wiring installed within ballast compartment of light fixtures rated 90°C, Type THHN.
 - f. Analog Control/Communications (TSP or TST) – Provide tinned copper, polyethylene insulated, twisted pair or triplet, aluminum-polyester, overall shield with 20-gauge drain.
 - g. Provide analog signal conductors sized as shown on drawings with minimum size of 18-gauge.
 - h. For all discrete signal conductors, provide copper stranded, 600V, Type THWN with a minimum size of #14, unless otherwise noted.
 - i. For all control conductors installed in underground conduits provide cable listed as suitable for direct burial.
 - 2. Splices, Connections and Terminations (0 to 600V):
 - a. For #8 AWG, use solderless pressure connectors with insulating covers for copper wire splices and taps. Use insulated spring wire connectors with plastic caps for #10 AWG and smaller.

- b. Use insulated, mechanical connectors for copper wire splices and taps, #6AWG and larger, ILSCO or approved equal. Tape connectors with electrical tape to prevent moisture infiltration.

2.4 GROUNDING AND BONDING

- A. Applicable standards:
 1. UL 467-1998: Grounding and Bonding Equipment.
 2. NFPA 70: National Electrical Code.
 3. ANSI/IEEE 32: Requirements, Terms and Test Procedures for Neutral Grounding Devices.
 4. IEEE 80: Guide for Safety in Substation Grounding.
 5. IEEE 81: Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
 6. NETA ATS: Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Associates).
- B. Grounding electrodes (Rod type):
 1. Acceptable Manufacturers:
 - a. LTV Copperweld.
 - b. Line Material.
 2. Material: Copper-clad steel.
 3. Diameter: $\frac{3}{4}$ ".
 4. Length: 10'-0"
 5. Type: Sectional.
- C. Mechanical connectors:
 1. Acceptable Manufacturers:
 - a. Burndy.
 - b. Robbins.
 - c. Harger.
 2. Material: Bronze.
- D. Exothermically-welded connections:
 1. Acceptable Manufacturers:
 - a. Cadweld.
- E. Grounding Electrode Conductor:
 1. Material: Bare, soft-drawn, stranded, copper.
 2. Minimum size: Meet NEC 70 requirements.
- F. Bonding Material:
 1. Material: Bare, soft-drawn, stranded, copper.
 2. Minimum size: Meet NEC 70 requirements.
- G. Regulatory requirements:
 1. Products: Listed and classified by UL as suitable for the purpose specified and indicated.
- H. Ground Access Wells:
 1. Provide 12"x12"x12" polymer concrete ground access well where indicated on plans.
 2. Provide engraved cover with "ground" indicator.
 3. Rated for a minimum of 20,000 lbs.
 4. Provide Harger GAW series or approved equal.

2.5 TRANSIENT VOLTAGE SURGE PROTECTION

- A. Applicable standards:
 1. UL 1449 4th Edition - transient Voltage Surge Suppressor.
 2. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits.
 3. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
 4. UL 67 - Panelboards (when mounted in panelboards).

5. UL 891 - Dead-Front Switchboards (when mounted in switchboards).
 6. NEMA LS1 - National Electrical Manufacturer's Association – 1992, R2000.
 7. MIL STD. 220A - Test Methods of Insertion Loss.
- B. Acceptable Manufacturers:
1. Advanced Protection Technologies, Inc. (APT).
 2. American Power Conversion Corporation (APC).
 3. EFI Electronics.
 4. Cutler Hammer.
 5. Current Technology.
 6. Leviton.
- C. Surge Suppression Device (SPD):
1. Manufacturer's published UL 1449 Fourth Edition test results shall reflect SPD connected lead length of 6" or greater.
 2. Provide SPD devices with a minimum EMI/RFI filtering of -50dB at 100 kHz using MIL-STD-220A methodology.
 3. Provide a SPD unit with a short circuit current rating clearly marked and install at a point on the system where the available fault current is in excess of that rating.
 4. Provide dedicated circuit breaker/disconnect for the SPD.
 5. Provide SPD with one set of NO/NC dry contacts.
 6. Provide SPD with protection-indicating LED's that are visible without opening enclosure.
 7. Provide NEMA 4 SS Enclosure.
 8. Provide SPD that meets or exceeds the following criteria:
 - a. Maximum UL Suppression Voltage Rating (SVR) and Maximum Operating Voltage (MCOV):

System Voltage	L-N	L-G	N-G	L-L	MCOV
120/240V 1Ø Split Phase	330	330	330	700	150
480/277V 3Ø	700	700	600	1200	320

- b. Minimum Surge Capacity and modes of protection:

SPD Location	Modular Parallel Protection	Modes of Protection	RFI Filtering	Surge Capacity Per Mode
Branch Circuit Panels ≤ 200A	No	L-N, N-G	No	80kA

2.6 OUTLET BOXES

- A. Applicable standards:
1. ANSI/NEMA OS 1: Sheet-steel Outlet Boxes, Device Boxes, Covers and Box Supports.
 2. ANSI/NEMA OS 2: Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
 3. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).
 4. NEMA FB 1: Type FD, Cast Ferroalloy Boxes.
 5. UL 508: UL Standard for Safety Industrial Control Equipment.
- B. Types and properties:
1. Outlet boxes:
 - a. Sheet metal outlet boxes (ANSI/NEMA OS1; galvanized steel, with 1/2" male fixture studs where required).
 - b. Nonmetallic outlet boxes (ANSI/NEMA OS2).
 - c. Cast boxes (NEMA FB1; deep type, gasketed cover, threaded hubs).
- C. Pull and junction boxes:
1. Sheet metal boxes:
 - a. Indoor location installations:
 - 1) Provide the type specified in ANSI/NEMA OS1, 316 stainless steel unless stated otherwise on drawings.

- 2) Provide hinged-type enclosure for enclosures larger than 12 inches in any dimension.
- b. Indoor location installations: Provide hinged-type enclosure for enclosures larger than 12 inches in any dimension.
2. Cast aluminum boxes:
 - a. Outdoor and wet location installations: Conform to NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain tight, cast aluminum box cover with ground flange, neoprene gasket, and stainless-steel cover screws as manufactured by Cooper Crouse-Hinds.
3. Non-metallic boxes:
 - a. Above ground location installations: Conform to UL 508, NEMA type as shown on drawings, molded fiberglass polyester, with removable hinged cover, neoprene gasket, and stainless-steel cover screws as manufactured by Hoffman.
 - b. In Ground location installations: Conform to UL 508, NEMA type as shown on drawings, pre-cast polymer concrete, with removable, heavy-duty bolted cover, and stainless-steel cover screws as manufactured by Strongwell.
- D. Outlet box schedule, unless otherwise noted:
 1. Interior boxes:
 - a. Galvanized extensions and rings.
 - b. Ganged where two or more devices occur at the same location.
 - c. One-piece type.
 - d. Studs for lighting fixtures, when required.
 - e. Lugs or ears to secure covers or plaster rings.
 - f. As required, covers or plaster rings.
 - g. Small exposed boxes - galvanized cast type with hubs.
 - h. Large exposed and exterior boxes - NEMA 4X type.
 2. Ceiling boxes, minimum 4" x 4" x 2-1/8" deep, or 4" octagon x 2-1/8" deep, of one-piece construction, except where otherwise specified herein or when larger size is required by code.
 3. Provide masonry type boxes in block walls.
 4. Provide concrete type in poured slabs.
 5. Provide non-metallic boxes for underground installations.
- E. Box locations:
 1. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.
 - a. Electrical box locations shown on Contract Drawings are approximate unless dimensioned.
 - b. Verify the location of all boxes and outlets prior to rough in.
 - c. Locate the boxes to allow access.
 - d. Locate and install boxes such that headroom is maintained, and a neat appearance is presented.

2.7 WIRING DEVICES

- A. Applicable standards:
 1. FS W-C-596: Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
 2. FS W-S-896: Switch, Toggle.
 3. NEMA WD 1: General Purpose Wiring Devices.
 4. NEMA WD 2: Semiconductor Dimmers for Incandescent Lamps.
 5. NEMA WD 5: Specific Purpose Wiring Devices.
 6. UL 943: Standard for Ground Fault Circuit Interrupters.
- B. Acceptable Manufacturers:
 1. Hubbell.
 2. Pass and Seymour.
 3. General Electric.
 4. TayMac.
 5. Lutron.
 6. Leviton.

- C. Wall Switches:
 - 1. Provide wall switches for lighting circuits and motor loads under 1/2 HP conforming to NEMA WD; FS W-S-896; AC-general use snap switch with toggle handle, rated 20 amperes and 120-277VAC.
 - 2. Provide switch with gray handle.
 - 3. For exterior applications, provide cast box and weatherproof actuating lever toggle switch cover.

- D. Receptacles:
 - 1. Provide convenience and straight-blade receptacles conforming to NEMA WD 1, locking blade receptacles conforming to NEMA WD 5, and convenience receptacle configuration conforming to NEMA WD 1; Type 5-20, gray plastic face.
 - 2. Provide specific-use receptacle configuration conforming to NEMA WD 1 type as indicated on the drawings, and with a brown plastic face.
 - 3. Provide GFCI duplex convenience receptacles with integral ground fault current interrupters and gray plastic face.

- E. Wall Plates:
 - 1. Provide type 304 stainless steel oversized (jumbo) interior wall plates.
 - 2. Provide continuous-use rated exterior device cover. Provide cover constructed entirely of UV stabilized high impact polycarbonate material with gasket, stainless steel mounting screws and UL listed for wet location continuous-use. Provide cover equal to TayMac Specification Grade series.
 - 3. Design plates to fit the device or devices on which they are used.

2.9 ENCLOSED CIRCUIT BREAKERS

- A. Applicable standards:
 - 1. FS W-C-375: Circuit Breakers, Molded Case, Branch Circuit and Service.
 - 2. NEMA AB 1-93: Molded Case Circuit Breakers and Molded Case Switches.
 - 3. UL-489: Molded Case Circuit Breakers and Circuit Breaker Enclosures.
 - 4. UL-50: Cabinets and Boxes.
 - 5. NEMA-250: Enclosures for Electrical Equipment.

- B. Acceptable manufacturers:
 - 1. General Electric.
 - 2. Square D.
 - 3. Cutler-Hammer.
 - 4. Siemens Energy & Automation.

- C. Enclosed Circuit Breakers:
 - 1. Enclosed Molded-Case Circuit Breaker: NEMA AB 1, lockable handle. Handle lockable in OFF position. Provide enclosures type as indicated on Drawings.
 - 2. Provide frame size, trip rating, number of poles, and auxiliary devices as indicated, interrupting capacity rating to meet available fault current, 35,000 RMS symmetrical amperes minimum, with appropriate listing when utilized for switching fluorescent lighting, heating, air-conditioning and refrigeration equipment.
 - 3. Provide shunt-trip where indicated, 120V, 60Hz.
 - 4. Provide interchangeable trip units, on circuit breakers 200 amps and larger, with trip units interchangeable within frame size.

2.10 MINI-POWERZONES

- A. Applicable standards:
 - 1. UL 1062: Standard for Unit Substations.

- B. Acceptable manufacturers:
 - 1. General Electric.
 - 2. Square D.
 - 3. Eaton.

- C. The mini-powerzone consists of an encapsulated dry type transformer, primary and secondary main circuit breakers, and secondary panelboard all in one enclosure.
 - 1. Transformer Rating: KVA, primary voltage, secondary voltage, frequency and number of phases shall be as shown on the Drawings.
 - 2. Branch Circuits: Molded case circuit breakers, plug in thermal magnetic type with number of poles and trip ratings as shown on the Drawings.
 - 3. Enclosure: Weatherproof, NEMA 3R, stainless steel.

2.11 DISCONNECT/SAFETY SWITCHES

- A. Applicable standards:
 - 1. ANSI/UL 198C: High intensity capacity fuses; current limiting types.
 - 2. ANSI/UL 198E: Class R fuses.
 - 3. FS W-F-870: Fuse holders (for plug and enclosed cartridge fuses).
 - 4. FS W-S-865: Switch, box (enclosed), surface-mounted.
 - 5. NEMA KS 1: Enclosed switches.

- B. Acceptable manufacturers – Disconnect/safety switches:
 - 1. General Electric.
 - 2. Square D.
 - 3. Cutler-Hammer.
 - 4. Siemens Energy & Automation.
 - 5. Engineer approved equal.

- C. Disconnect/Safety Switches:
 - 1. Fusible (safety) switch assemblies: NEMA KS 1; type HD, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - a. Provide override screw to permit opening front cover with switch in ON position.
 - b. Provide the handle lockable in OFF position.
 - c. Provide fuse clips designed to accommodate Class R fuses.
 - d. Provide enclosure types as indicated on Drawings.
 - 2. Non-fusible (disconnect) switch assemblies: NEMA KS 1; type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - a. Provide override screw to permit opening front cover with switch in ON position.
 - b. Provide the handle lockable in OFF position.
 - c. Provide enclosure types as indicated on Drawings.

- D. Fuses:
 - 1. Fuses 600 Amperes and Less: Current limiting type.
 - 2. Fuse Interrupting Rating: 200,000 RMS symmetrical amperes.

- E. Acceptable manufacturers - Fuses:
 - 1. Gould-Shawmut.

2. Bussman.
 3. Engineer approved equal.
- F. Provide NEMA 4X 316 stainless steel in all interior process area and exterior installations. Provide NEMA 12 (stainless steel) in all other installations.

2.12 CONCRETE SUPPORT FOUNDATIONS

- A. Install each freestanding unit of electrical equipment on a 4” thick, 3000 PSI wire mesh reinforced concrete pad or curb with 36” clear on front side and 12” clear on all remaining sides, unless otherwise noted on drawings. Provide ¾” chamfer all sides.

2.13 MISCELLANEOUS MATERIALS

- A. Provide support framing, channel and associated accessories of stainless steel aluminum conforming to the Drawings
- B. Provide 316 stainless-steel (bolts, nuts, washers, U-bolts, anchors, threaded rods, etc.) attachment hardware.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Coordination:
1. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
 2. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total Work.
 3. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, provide required supports and wiring to clear the encroachment.
- B. Data indicated on the Drawings and in these Specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the Drawings and Specifications should be used only for guidance in such regard.
- C. Where outlets are not specifically located on the Drawings, locate as determined in the field by the Engineer. Where outlets are installed without such specific direction, relocate as directed by the Engineer and at no additional cost to the Owner.
- D. Verify all measurements at the building. No extra compensation will be allowed because of differences between work shown on the Drawings and actual measurements at the site of construction.
- E. Branch circuit wiring and arrangement of home runs have been designed for maximum economy consistent with adequate sizing for voltage drops and other considerations. Install the wiring with circuits arranged exactly as shown on the Drawings, except as otherwise approved in advance by the Engineer.

3.3 ELECTRICAL SERVICE

- A. Verify location of utility transformer pad and install per utility company specifications, providing all materials and labor required for a complete installation. Verify location of utility company secondary delivery point and report any discrepancies to the Engineer immediately.

3.4 TRENCHING AND BACKFILLING

- A. Perform trenching and backfilling associated with the work of this Section at depths as required by the NEC..

3.5 CONDUCTORS

- A. Install no conductor smaller than #12 AWG unless otherwise indicated.
- B. Provide copper conductors.
- C. Provide conductors as shown on the plans or as specified herein.
- D. Provide continuous wiring from outlet to outlet, identified by color and marked with size, grade and manufacturer.
- E. Provide continuous wiring without joints, through pull boxes.
- F. Provide minimum of #10 AWG conductors on branch circuits, which exceed 100' at 120 volts and 200' at 277 volts from panel to load center.
- G. Terminate #14 AWG stranded conductors where indicated for control, using insulated compression-type spade lugs.
- H. Terminate #12 AWG stranded conductors using insulated compression-type spade lugs.
- I. Install an equal number of conductors for each phase of a circuit in the same raceway or cable.
- J. The conductor lengths for parallel circuits must be made equal.
- K. Neatly train and lace all wiring inside boxes, equipment, and panel boards.
- L. Connect circuits sharing a common neutral to different phases regardless of the numbering.
- M. Provide phase, neutral, and ground conductors as required to accommodate metering installed. Any additional conductors required for meter to function properly shall be installed at the Contractor's expense.

3.6 COLOR CODE AND MARKERS

- A. Provide color-coding for #12 and #10 conductors as follows:

	277/480-Volt	120/208(240)-Volt
Phase "A"	Brown	Black
Phase "B"	Orange	Red
Phase "C"	Yellow	Blue
Neutral	White with Tracer	White
Ground	Green	Green

Mark all conductors #8 and larger and all feeders with plastic tape to match the above color-coding.

- B. Mark all 480-volt equipment with red laminated plastic nameplates having one-half inch (1/2") engraved lettering, reading "DANGER 480-VOLTS". Attach plate to equipment with stainless steel screws.
- C. Mark conductors within panelboards with self-sticking label bearing the number corresponding to the circuit number on the drawings. Connect these conductors to corresponding breaker in panel. Mark circuit numbers in outlet boxes only where color-coding is repeated by having two or more conductors of the same color.
- D. Mark equipment, panelboards, cabinets, control devices, starters, switches, etc. by means of black, white core laminated nameplates having 1/4" engraved lettering. Provide designations as indicated on the drawings. Attach plates to equipment with stainless steel screws.

3.7 SPLICES, CONNECTIONS, AND TERMINATIONS IN 600V. CONDUCTORS

- A. Provide final connections and/or terminations for all wiring indicated on the electrical drawings and in this division of the specifications. Equipment supplied under other divisions of the specifications that require electrical connections under this division shall be provided with Engineer approved wiring and termination diagrams.
- B. Splice only in accessible junction boxes.
- C. Thoroughly clean wires before installing lugs and connectors.
- D. Terminate spare conductors with electrical tape.

3.8 RACEWAYS AND FITTINGS

- A. Apply cold galvanizing compound to all field-cut threads prior to installation.
- B. In general, follow the raceway installation layout shown on the plans, however, this layout is diagrammatic only, and where changes are necessary due to structural conditions, other apparatus or other causes, make such changes without any additional cost to the Owner.
- C. Cut all conduits square using a saw or pipe cutter and de-burr cut ends.
- D. Install the conduit to the shoulder of fittings and couplings and fastened securely.
- E. Use conduit hubs, or sealing locknuts, for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.
- F. No more than the equivalent of three 90-degree bends may be installed between boxes.
- G. Use conduit bodies to make sharp changes in direction, as around beams.
- H. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2" size.
- I. Avoid Moisture traps where possible; where moisture traps are unavoidable, there must be a junction box with drain fitting provided at the conduit low point. Use suitable conduit caps to protect installed conduit against entrance of dirt, concrete, plaster, mortar, and moisture.
- J. Size all conduits for conductor type installed with 3/4" being the minimum size conduit allowed.
- K. Arrange conduit to maintain headroom and present a neat appearance.
- L. Route any exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- M. Provide at all times a minimum of 6" clearance between conduit and piping and a 12" clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- N. Arrange all conduit supports to prevent distortion of alignment by conductor pulling operations.

- O. Fasten conduits above finished ceilings using straps, lay-in adjustable hangers, clevis hangers or bolted split stamped hangers.
 - 1. Do not fasten conduit with wire or perforated pipe straps. All wire that was used for temporary conduit support during construction must be removed before conductors are pulled.
 - 2. All conduits must be supported at a maximum distance of 5' on centers.
- P. Group conduits in parallel runs where practical using a conduit rack.
- Q. Make all underground conduit joints watertight by applying manufacturer's recommended thread compound. Thread compound must be conductive and be compatible with conduit and conductor-jacket material.
- R. Provide suitable pull string or #12 AWG insulated conductor in empty conduit, except sleeves and nipples.
- S. Maintain minimum 12" clearance between all conduits containing signal circuits and conduits containing power circuits.
- T. Install expansion-deflection joints where conduit crosses building expansion or seismic joints.
- U. Where conduit penetrates fire-rated walls and floors, the opening around the conduit must be sealed with UL listed foamed silicone elastomer compound.
- V. Install exposed raceways either parallel or perpendicular to building walls.
- W. Install raceways exposed on walls or free-standing perpendicular to the floor.
- X. Install exposed raceways on channel so as to provide a minimum spacing of ½" between raceway and the surface to which it is mounted.
- Y. Bends:
 - 1. Where emerging from walls, ceilings, floor or concrete slabs, all conduit bends shall be made entirely within the structure (i.e.: the conduit shall emerge perpendicular to the surface and the bend shall be covered).
 - 2. Make all 90-degree conduit turns with factory-bent, rigid galvanized steel, long radius elbows.
 - 3. Utilize rigid galvanized steel, long radius elbows on all 90-degree conduit bends of 2" and larger.
- Z. Install no metal conduit in contact with the earth or concrete slab unless protected with two coats of bitumastic coating or shrink wrap.
- AA. Provide necessary sleeves and chases where conduits pass through floors and walls, and provide other necessary openings and spaces, arranging for in proper time to prevent unnecessary cutting in connection with the Work.
- BB. Perform cutting and patching in accordance with the provisions for the original Work.
- CC. Refer to Section 02221 for minimum cover of underground conduits.
- DD. Sealing Conduit:
 - 1. Install watertight conduit hubs on all conduits terminating in the top or sides of NEMA 3R, 4 or 4X enclosures.
 - 2. Use a sealing locknut having an integral gasket on conduits terminating in the bottom of NEMA 3R, 4 or 4X enclosures.
 - 3. Seal all conduits terminating in NEMA 3R, 4 or 4X enclosures with duct seal.
 - 4. Seal watertight all conduits terminating in NEMA 6 or watertight rated enclosures.
 - 5. Install sealing compound and fiber, per manufacturer's recommendation, in hazardous location conduit sealing fittings. Tighten plugs per manufacturer's recommended torque.

- EE. Make motor lead connections and connections to other electrical equipment subject to vibration, or where indicated with flexible weatherproof type steel core conduit with wrapping and cover, factory assembled.
- FF. Conduit installations in hazardous locations as defined by Article 500 of the NEC must conform to the special requirements of Articles 501, 502, and 503 of the NEC.
- GG. Chapter 9 of the NEC shall apply unless larger raceways are specified.
- HH. Ensure all threads are fully installed into fittings, boxes, enclosures and equipment per NEC and UL listing requirements to provide mechanical integrity, grounding and sealing. Provide fittings and adapters to ensure full length of conduit or conduit fitting threads are installed per code and listing requirements.
- II. Liquidtight flexible metal conduit shall be supported and securely fastened within 12 inches of each box, cabinet, conduit body or other conduit body termination and shall be supported and secured at intervals not to exceed 4-1/2 feet. Flexible metal conduit shall not exceed 6 feet in length except for luminaire connections as allowed per the NEC.

3.9 CONDUIT SUPPORTS

- A. Seal all ends of non-metallic conduit support with manufacturer's recommended sealer.
- B. Provide UL listed vinyl end caps for all ends of strut-type metallic conduit supports.
- C. Provide all miscellaneous materials and supports as required by the NEC and these specifications to provide support for conduits, raceways, boxes, fittings and equipment.

3.10 GROUNDING AND BONDING

- A. Ground and bond the electrical system and motors in accordance with Article 250 of the NEC.
- B. Install electric bond around panels, cabinets, pull boxes, enclosures, etc., to incoming and outgoing sub-feed raceways by use of grounding type bushings.
- C. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- D. Provide grounding electrode conductor(s) and connect as shown on drawings.
- E. Bond together metal siding not attached to grounded structure; bond to ground.
- F. Provide separate, insulated, green equipment grounding conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- G. Provide grounding type bushings for conduits 1" or larger and bond to ground bar or lug of enclosure.
- H. Bond neutral and ground at service entrance only.
- I. Provide exothermic-type weld grounding connections that are buried or otherwise normally inaccessible, and excepting specifically those connections for which access is required for periodic testing.
- J. Make each grounding connection strictly in accordance with the manufacturer's written instructions. Failure to follow manufacturer's written instructions shall result in immediate rejection.
- K. Welds which have "puffed up" or which show convex surfaces, indicating improper cleaning, are not acceptable. Provide grounding connection devices compatible with the conductor(s) and/or rods being joined.

- L. Maximum acceptable resistance to earth ground is 25 Ohms. Provide testing of the service entrance system ground and verify the resistance to earth ground is within the specified requirements. If the existing service entrance ground does not meet the specified requirements, install additional rod electrodes as required to achieve specified resistance to ground.

3.11 TRANSIENT VOLTAGE SURGE PROTECTION

- A. Field Installed:
 - 1. Connect SPD ground to service entrance grounding electrode conductor or to equipment grounding conductor if SPD located downstream of service entrance equipment. Confirm SPD installed per manufacturer's recommendation.
 - 2. Install SPD on the load side of the main circuit breaker.
 - 3. Install SPD in accordance with manufacturer instructions.
 - 4. Maximum lead length 12".
 - 5. Provide an externally mounted SPD as indicated on the drawings.

3.12 OUTLET BOXES

- A. Do not install boxes back-to-back in walls. Install the boxes at a minimum of 6" apart except in acoustic-rated walls with a minimum separation of 12".
- B. Locate boxes in masonry walls such that only the cutting of the masonry unit corner is required. Coordinate masonry cutting such that neat openings for the boxes can be achieved.
- C. Provide knockout closures for unused openings.
- D. Support boxes independently of the conduits.
- E. Use multiple gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- F. Install boxes in the walls without damaging wall insulation.
- G. Install outlets to locate luminaires as shown on plans. In inaccessible ceiling areas, position outlets and junction boxes within 6" of recessed luminaires, to be accessible through luminaire ceiling opening.
- H. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness.
- I. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- J. Align wall mounted outlet boxes for switches, thermostats, and similar devices.
- K. Provide cast outlet boxes in locations (exposed to the weather) and indoor wet locations.
- L. Size all boxes in strict accordance with Article No. 370 of the NEC, except that no box will be less than the minimum specified.
- M. Check the location of all outlets to see that the outlets will clear any new or existing wall fixture, shelving, work tables, sinks, bulletin boards, etc. and the outlet will fit the area intended.
- N. Set floor boxes level and flush with finish flooring material. Use cast iron floor boxes for installations in slab on grade.
- O. Locate pull and junction boxes above accessible ceilings or in unfinished areas. Support pull and junction boxes independently of conduit.
- P. Install underground boxes as shown on drawings with top of box approximately 2" above finished grade. Install bottom of box over 12" of gravel to allow for adequate drainage.

3.13 CONVENIENCE OUTLETS AND SWITCHES

- A. Install wall switches at 48" above the floor level and 6" from edge of door jam on strike side, unless otherwise noted on Drawings.
- B. Install wall switches with the OFF position down.
- C. Install convenience receptacles at 18" above the floor level or 6" above counter or backsplash.
- D. Install convenience receptacles with the grounding pole on top.
- E. Install all specific-use receptacles at heights shown on Contract Drawings.
- F. Install decorative plates on switch, receptacle, and blank outlets in finished areas using jumbo size plates for outlets installed in masonry walls.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Install devices and wall plates flush and level.

3.14 LIGHTING FIXTURES

- A. Install lamps in luminaires and lamp holders.
- B. Support surface-mounted luminaires; provide auxiliary support, laid across top of ceiling TS, fasten to T using bolts, screws, rivets, or approved ceiling framing member clips.
- C. Install fluorescent luminaires larger than 2'x4' size independent of ceiling framing.
- D. Install recessed luminaires to permit removal from below. Install grid clips. Support luminaires independently with 12-gauge minimum, galvanized, soft-annealed, mild steel wire.
- E. Replace all non-operational lamps at completion of work.
- F. Touch up luminaire and pole finish at completion of work with manufacturer's color- respective touch up kit.
- G. Securely ground all lighting fixture housings.
- H. Align luminaires and clean lenses and diffusers at completion of work.
- I. Clean excess paint, dirt, and debris from installed luminaires.

3.15 POWER EQUIPMENT

- A. Provide power and control wiring for motor starters and safety switches as shown on the Drawings.
- B. Connections to miscellaneous building equipment:
 - 1. Wire to, and connect to, all items of building equipment not specifically described but to which electrical power is required.
 - 2. Coordinate as necessary with other trades and suppliers to verify types, numbers, and locations of equipment.

3.16 MOUNTING OF CONTROL PANELS AND ELECTRICAL EQUIPMENT

- A. Install all equipment per the manufacturer's recommendations and the contract drawings.
- B. Install surface-mounted panelboards plumb, in conformance with NEMA PB 1.1.
- C. Install disconnect switches with centerline at 48" above finished floor, grade, etc. unless otherwise noted.

- D. Secure switchboard assemblies to foundation or floor channels.
- E. Secure disconnect switches to channel frames with spring-type fasteners and hardware intended for this specific use where wall mounted, unless otherwise indicated.
- F. Mount floor and wall mounted equipment utilizing Type 316 stainless steel anchors and fasteners of the size and number recommended by the manufacturer.
- G. Provide necessary hardware to secure the assembly in place.
- H. Provide 316 stainless steel fasteners for all other installation types.
- I. Inspect switchboards and panel boards for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.
- J. Install and check all equipment in accordance with the manufacturer's recommendations.
- K. Ensure that equipment mounting pad locations are level to within 0.125 inches per three foot of distance in any direction. Notify Engineer immediately if any discrepancies are found in the field.
- L. Ensure that all equipment bus bars are torqued to the manufacturer's recommendations.
- M. Assemble all equipment shipping sections, remove all shipping braces and connect all shipping split mechanical and electrical connections.
- N. Provide filler plates for unused spaces in panelboards and switchboards.
- O. Provide typed circuit directory with protective plastic sleeve secured to inside of panel door for each branch circuit panelboard.
- P. Provide Micarta type labels located adjacent to each breaker operator, delineating equipment served for each circuit breaker in all switchboards.
- Q. Measure steady state load currents at each switchboard and panelboard feeder. Should the voltage difference measured at the equipment between any two phases exceed 20 percent, rearrange circuits to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- R. Measure and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only).

3.17 TESTING AND INSPECTION

- A. Provide personnel and equipment, make required tests, and secure required approvals from the Engineer and governmental agencies having jurisdiction.
- B. Provide written notice to the Engineer adequately in advance of each of the following stages of construction:
 - 1. In the underground condition prior to placing concrete floor slab, when all associated electrical work is in place.
 - 2. When all rough-in is complete, but not covered.
 - 3. At completion of the work of this Section.
- C. When material and/or workmanship are found to not comply with the specified requirements, replace items within three days after receipt of notice at no additional cost to the Owner.
- D. Provide a qualified field serviceman, representing the manufacturer of each piece of major electrical equipment, to make proper and complete adjustments of all adjustable devices, load switches, etc. after final installation and completion of all field wiring. Verify and approve all connections prior to

any initial or test operation of equipment. Submit confirmation in writing by the manufacturer's authorized representative of said services to the Engineer.

3.18 HAZARDOUS LOCATIONS

- A. Wiring and equipment in hazardous locations, as defined by the NEC, shall conform to the special requirements of the NEC, unless otherwise indicated or specified.

3.19 CLEANING AND PAINTING

- A. Collect and remove from the premises all debris, scraps and other waste material after completion of work.
- B. Tamp and level all trench work.
- C. Remove excess dirt and debris, when and as directed by the Engineer.
- D. Thoroughly clean all electrical equipment, lighting fixtures, exposed conduit, enclosures and boxes of all foreign materials and paint in accordance with Section 09900 of these Specifications unless noted or directed otherwise.
- E. Clean any exposed threaded area of raceway of cutting oil and paint with a cold galvanizing compound prior to final finish painting.

3.20 ELECTRIC EQUIPMENT BY OTHERS

- A. The equipment manufacturer shall furnish all motors for equipment.
- B. Verify voltage, dimensions, extent, type, etc. of this and all other such electrical equipment.
- C. Furnish and install all electrical supply and control equipment and material required to put all the items in proper operative condition.
- D. Refer to other sections of these specifications for verification of other equipment and devices requiring electrical connections, wiring and devices not included in this section.
- E. Refer to other drawings for details not indicated on the electrical drawings.
- F. Prior to connecting any piece of such equipment, check the nameplate data against the information shown on the drawings and call to the immediate attention of the Engineer any discrepancies discovered.

3.21 PROJECT COMPLETION

- A. Test all 600-Volt service entrance and feeder wiring using an instrument, which applies a voltage of approximately 500 volts DC to provide a direct reading of resistance.
- B. Perform test on ground system utilizing Fall-Of-Potential method. Meg grounding systems to measure ground resistance, and provide not more than 5 ohms resistance, adding ground rods as necessary to achieve that level.
- C. Conduct all tests in presence of Engineer or his representative. Identify and properly record all readings. Submit readings to Engineer for acceptance.
- D. Measure voltages as directed by the Engineer and report to him these values.
- E. Provide entire system free from all shorts and grounds.
- F. Fully comply with local and national codes for equipment bonding and grounding.

- G. Test system in the presence of the Engineer and operate to his complete satisfaction in accordance with true intent of plans and specifications. Defray cost of all adjustments necessary to bring system up to standards set forth by Contract Documents at no additional cost.
- H. Thoroughly indoctrinate the Owner's operation and maintenance personnel in the contents of the operations and maintenance manual.
- I. On the first day the facility is in operation, for at least eight (8) hours at a time directed by the Engineer, provide a qualified foreman and crew to perform such electrical work as may be required by the Engineer.

END OF SECTION

APPENDIX A

GEOTECHNICAL ENGINEERING REPORT

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Geotechnical Engineering Report

**Flatrock Lift Station
Walhalla, Oconee County, SC**

August 2, 2022

Terracon Project No. 86225088

Prepared for:

KCI Technologies, Inc.
Piedmont, SC

Prepared by:

Terracon Consultants, Inc.
Greenville, South Carolina



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Greenville, SC 29615
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Terracon.com

August 2, 2022

KCI Technologies, Inc.
106 Clair Road
Piedmont, SC 29673

Attn: Mr. Thomas Vollmar, PE
P: (864) 714.1280
E: thomas.vollmar@kci.com

Re: Geotechnical Engineering Report
Flatrock Lift Station
190 Duck Pond Road
Walhalla, Oconee County, SC
Terracon Project No. 86225088

Dear Mr. Vollmar:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P86225088 dated June 2, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of the proposed new lift station.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Maggie E. McKenney, EIT
Sr. Staff Engineer

Stephen E. Greaber, PE
Principal | Sr. Geotechnical Engineer

REPORT TOPICS

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Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the **GeoReport** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.



Geotechnical Engineering Report

Flatrock Lift Station

190 Duck Pond Road

Walhalla, Oconee County, SC

Terracon Project No. 86225088

August 2, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed lift station to be located at 190 Duck Pond Road in Walhalla, Oconee County, SC. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Demolition considerations
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per IBC
- Lateral earth pressures

The geotechnical exploration Scope of Services for this project included the advancement of three test borings to depths ranging from approximately 17 to 27 feet below existing site grades. Two 5-foot NQ-sized rock core runs were obtained at Boring B-1.

Maps showing the site and boring locations are shown in the [Site Location](#) and [Exploration Plan](#) sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and on separate graphs in the [Exploration Results](#) section. Photographs of the rock cores obtained are also included.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 190 Duck Pond Road in Walhalla, Oconee County, SC. < 1 Acre Lat/Long: 34.7321, -83.0814 (approximate) See Site Location .

Geotechnical Engineering Report

Flatrock Lift Station ■ Walhalla, Oconee County, SC

August 2, 2022 ■ Terracon Project No. 86225088



Item	Description
Existing Improvements	Existing sewer lift station with emergency generator, underground diesel tank, lift station wet well, radio tower, fencing.
Current Ground Cover	Earthen and gravel surface. Soil slopes.
Existing Topography	Relatively flat around lift station access road area at about Elevation 855.5 feet. Sloping condition on north side of site toward Lake Keowee. Approximately 18 feet elevation difference between lift station area and lake level. Per sketch provided, estimated lake level at about Elevation 837 feet +/-.
Geology	<p>The project site is located within the Piedmont Physiographic Province of South Carolina, an area underlain by ancient metamorphic rock (Granitic Gneiss). The topography and relief of the Piedmont has developed from differential weathering of the igneous and metamorphic bedrock. The residual soils in this area are the product of in-place chemical weathering of rock. The typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced, underlain by sandy silts and silty sands that generally become harder with depth to the top of parent bedrock.</p> <p>The boundary between soil and rock is not sharply defined due to variations in weathering and the presence of soft rock. The transition zone is locally termed as "partially weathered rock". Partially weathered rock is defined for engineering purposes as residual material that can be drilled with soil boring methods but exhibits standard penetration test (SPT) N-values exceeding 100 blows per foot (bpf). The depth to partially weathered rock occurs at irregular depths due to variations in degree of weathering and variations in the material composition of the rock.</p>

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Mr. Thomas Vollmar, PE of KCI provided site photographs and a conceptual sketch of the planned new lift station. Proposed inverts for the lift station wet well were also provided on the sketch. Mr. Vollmar also provided a description of the construction in an email dated May 27, 2022. A description of other planned appurtenances was provided by Mr. Garrett Davis, PE.
Project Description	Construction of a new lift station including a wet well that will extend to about maximum 27 feet below existing grades.

Geotechnical Engineering Report

Flatrock Lift Station ■ Walhalla, Oconee County, SC

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Item	Description
Proposed Structure	The project includes a sewer pump lift/screen station with about 100 linear feet of 10-inch diameter ductile iron gravity sewer pipe and three manhole structures to tie into existing sewer. About 45 linear feet of 6-inch diameter ductile iron force main pipe are planned to tie into existing lines.
Other Features	A new generator pad will be constructed near the lift station. A dumpster pad will also be placed at the facility.
Finished Elevations	Top elevation of new lift station will reportedly be 846.5 feet. Lift station wet well, about 25 feet below existing grade. Planned Invert Elevation 830.0 feet with excavation to about Elevation 828.5 feet to facilitate bedding and bottom slab construction. Gravity sewer inverts will vary from Elevation 835.5 feet at lift station to Elevation 836 feet at tie in to existing sewer.
Grading/Slopes	Finished grades are expected to be similar to current grades. It is assumed some fill may be placed to repair the slope at the site. The final slope will be about 10 feet high and set at about 2H:1V.
Free-Standing Retaining Walls	None anticipated.
Pavements	Gravel pavements anticipated.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Topsoil	Organic laden soils, typically 5 inches thick where encountered.
2	Fill	Classified as silty sand (SM) to clayey sand (SC) with rock fragments. Variable consistency and slightly compact with SPT Values typically around 4 bpf with higher blow counts where rock fragments in shoe of sampler.
3	Residual Soils	Typically classified as fine to coarse grained silty sand, loose to medium dense.

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4	Partially Weathered Rock	Material sampled as very dense silty sand (SM). Encountered in boring B-2 from 22 to 24 feet below ground surface. Hard drilling noted below about 15-1/2 feet at Borings B-1 and B-3.
5	Bedrock	Auger refusal encountered at a depth of about 17 feet at B-1 and B-3 and 24 feet at boring location B-2. Rock cores at Boring B-1 from 17 and 27 feet indicated moderately weathered granitic gneiss rock. Recovery 73% to 65% and RQD between 25% and 16%.

Due to the small sample size, collected by split spoon samplers, it is not always possible to determine the presence of fill, especially if the fill material consists of the locally excavated soils and free from inclusions within the sample; therefore, the fill material is often mistaken for native soil. Based on the site history it is likely that disturbed native soils and historic fill are present at the surface of the site extending relatively deep adjacent to the existing backfilled wet well structure, with the historic fill possibly consisting of silty sand to clayey sand observed in the upper 8 to 17 feet in the boring locations across the site.

Groundwater was initially encountered in borings B-01 and B-02 during drilling at a depth of approximately 19 to 20 feet below the existing ground surface. After 15 minutes, the water was measured at about 18 feet below existing grade. A piezometer was installed to a depth of about 20 feet at boring location B-1. After 8 days, the ground water was measured at 18 feet below existing grade (Approximate Elevation 837 feet). No groundwater was encountered at boring B-3, which encountered auger refusal at a depth of about 17 feet below existing grade (Approximate Elevation 838 feet). This does not necessarily mean that the water levels summarized above are stable groundwater levels. Due to the low permeability of some of the soils encountered in the borings, a relatively long period of time may be necessary for the groundwater level to develop and stabilize in a borehole in these materials.

Groundwater fluctuations occur due to seasonal variations in the amount of rainfall, runoff, lake levels, site modification, and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. It is likely that stable groundwater levels will closely mirror the lake levels at this site location, but may be slightly higher than lake level during wet seasons. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Based on our understanding of the proposed construction and the data obtained from the soil borings and rock core, the site is generally suited for the planned lift station improvements. There are primary geotechnical considerations which must be addressed during the design and construction of the lift station utilities. These include the following:

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- Based on our visual classification of the soil samples from the upper approximate 17 feet, it appears that the on-site soils should be generally suitable for use as engineered fine grained fill for backfilling the new lift station; however, additional testing should be performed during construction to confirm suitability.
- The near surface relatively fine grained soils (primarily silty and clayey sands) in the upper soil material could become unstable with typical earthwork and construction traffic, especially after precipitation events. The effective drainage should be completed early in the construction sequence and maintained after construction to reduce potential stability issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the Earthwork section.
- All three borings encountered partially weathered rock (PWR) at depths ranging from about 15-1/2 to 24 feet below existing site grade. Auger refusal was encountered at depths ranging from 17 to 24 feet below existing grade (Elevation 838 to 831 feet). Two 5-ft rock core runs were performed at boring location B-1 from 17 to 27 feet (Elevation 838 feet to 828 feet). The rock was classified as moderately weathered granitic gneiss, with recovery ranging from 73% to 65% with a Rock Quality Designation (RQD) of between 25% and 16%. Two samples of intact rock were obtained and indicated compressive strength of about 3,380 psi at 19.5 feet and 8,460 psi at 24 feet.
- The planned invert for the lift station is reportedly at Elevation 830 feet, which may likely require an excavation to at least Elevation 828.5 feet to provide depth for minimum 6 inches of crushed stone bedding and an assumed minimum 12- inch thick concrete floor of the wet well/manholes. This depth of installation will require excavation through about 9-1/2 feet of moderately weathered rock at B-1. It is likely that some rock blasting will be necessary to facilitate the contractor's efficient removal of the weathered rock within the planned relatively confined lift station footprint.
- The depth of apparent weathered rock at Boring B-2 was at about Elevation 833, slightly deeper compared to the other two borings. The inverts for the planned new 10-inch gravity sewer lines are between Elevation 835.5 and 836 feet. We expect that some weathered rock removal may also be needed along the planned 100 feet of gravity sewer line and manhole structures.
- The primary geotechnical considerations affecting the lift stations are excavation stability and resistance of the lift stations to hydrostatic uplift. Based on the results of the exploration, we anticipate that the planned excavations will be performed partially through loose silty to clayey sand fill and residual soils, into partially weathered rock and finally moderately

weathered granitic gneiss. Groundwater is anticipated to be at levels close to the Lake Keowee level, but the contractor should verify the depth to water prior to beginning of excavation and shoring installation. Contractor will need to evaluate means and methods to maintain the excavation sufficiently dewatered during their construction process. The **Lift Station Design Considerations** section provides recommendations pertaining to design and construction of the proposed below grade features. The **Lateral Earth Pressures** section provides design estimates for horizontal forces on the wet well structure.

- There is currently a slope behind the existing lift station facility that exhibited minimal surface vegetation and is sloughing. In the Piedmont Physiographic Province region, up to about 15-foot tall slopes are regularly built at inclinations of up to 2(H):1(V) or flatter and perform satisfactory if properly constructed. Shallow sloughing at the surface can occur when slopes are not properly compacted and/or exposed to inclement weather prior to placement of vegetative cover. The SPT results in the fill materials suggest minimal compaction; therefore, we recommend that new fill slopes be over filled where possible to an initial 4H:1V or flatter slope and then cut back to 2H:1V or flatter to develop an adequately compacted slope face rather than tracking in the slope face for compaction. In addition, due to the relatively tight space and relatively steep slope for maintenance, a protective cover of rip rap placed over non-woven geotextile is recommended instead of vegetation as a permanent slope cover at this location.
- Support of equipment such as generators and dumpster pads on or above existing fill materials is discussed in this report. However, even with the recommended construction procedures, there is inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by following the recommendations contained in this report. Removing the fill at this site is likely not feasible, but to take advantage of the cost benefit of not removing the entire amount of undocumented fill, the owner must be willing to accept the risk associated with building over the undocumented fills following the recommended densification/reworking of the material. The **Shallow Foundations** section provides information for design of shallow support for generator pads and other at grade appurtenances.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include demolition of existing structures/slabs, clearing and grubbing, excavations and fill placement. The following sections provide general recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations and equipment slabs.

Site Preparation

We anticipate construction will be initiated by demolition of existing structures, stripping, vegetation, and loose, soft or otherwise unsuitable material. Stripped materials consisting of vegetation and organic materials should be wasted off site or used to vegetate landscaped areas. Topsoil measurements were made at the boring locations; however, stripping depths at or between our boring locations and across the site could vary considerably. As such we recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material. The existing gravel surface should be maintained in place to the extent practical to serve as a construction work surface. Former utility lines and utility backfill, where present, should be removed from beneath any planned new surface buildings, and the resulting excavations should be properly backfilled as outlined herein.

If subgrade soils are unsuitable, depending on the planned construction at that location, they may require removal and replacement; however, if they are unstable due to excessive moisture, an economical solution for remediation may be to scarify, dry and recompact the material. However, the limited space available at this site may limit drying of soils as a practical solution. This type of remediation is most effective during the typically hotter months of the year (May to October). If construction is performed during the cooler period of the year, or in periods of persistent precipitation, the timeline for scarifying, drying, and recompacting typically increases considerably and may lead to alternative remediation solutions. These solutions can include overexcavation of some or all of the unstable material to be backfilled with either approved engineered fill or a relatively clean, well-graded crushed stone or gravel. Incorporating geotextile/geogrid may also be considered. Potential undercutting can be reduced if the site preparation work is performed during a period of dry weather, site drainage conditions are maintained, and if construction traffic is kept to a minimum on prepared subgrades. We recommend that the contractor submit a unit rate cost for undercutting and replacement as part of the bidding process.

Existing Fill

As noted in **Geotechnical Characterization**, the borings encountered existing fill to depths ranging from about 8 to 17 feet. The SPT values suggest the fill is only slightly compact, and we have no records to indicate the degree of control used during placement. The new lift station wet well and the planned gravity sewer and related manholes will be excavated through the fill soils and will be placed on residual soils or weathered rock. Support of footings and floor slabs for related appurtenances (e.g., generator and dumpster pads, etc.) on or above existing fill soils is discussed in this report. However, even with the recommended construction procedures, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill. Removing and replacing the fill at this site is likely not practical, but the risk of building on it can be reduced by following the recommendations contained in this report.

Geotechnical Engineering Report

Flatrock Lift Station ■ Walhalla, Oconee County, SC

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If the owner elects to construct the equipment slabs for surface equipment on the existing fill, the following protocol should be followed. Once the site has been stripped, and any planned cut excavations completed, the entire area for surface construction feature should be densified. Densification should be performed after a suitable period of dry weather to ensure the moisture content is close to the optimum. Densification should be performed using a minimum of 5 passes (in perpendicular directions across the entire building area) of a heavy vibratory compactor weighing minimum 16,000 pounds (total operating weight). If soft areas are encountered, they should be mitigated. If the areas are isolated, mitigation by overexcavation and replacement with competent soils approved by the geotechnical engineer at the time of construction, may suffice. Once unsuitable materials have been remediated, and the subgrade has passed a proof-roll test, the existing, and undocumented fill that was removed can be evaluated for reuse as structural fill.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 5 feet of structures, pavements, constructed slopes, and other structural areas. General fill (non-structural) is material used to achieve grade outside of these areas, like landscaped areas. Earthen materials used for structural and general fill should meet the following material property requirements:

Soil Type ¹	USCS Classification (Parameters)	Acceptable Location For Placement
Imported Structural Fill	ML, CL, SC, SM, GM (LL < 50 & PI < 20)	All locations and elevations
On-Site Soils	SM, SC, CL (LL < 50 & PI < 30)	All locations and elevations
Aggregate	GP (SCDOT #57 or #67)	Lift Station Bedding
Aggregate Base	GP, GM (SCDOT Macadam Gradation)	Pavement

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.

Fill Compaction Requirements

Structural and general fill should meet the following compaction requirements.

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Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.	Same as Structural fill.
Minimum Compaction Requirements ^{1, 2, 3}	95% of maximum dry density below foundations, floor slabs, pavement subgrade, and other structural areas. 100% of maximum dry density for aggregate base beneath pavement.	92% of max.
Water Content Range ¹	Fine Grained Soils: -2% to +2% of optimum Granular: -3% to +3% of optimum ² Aggregate Base: -2% to +2% of optimum	As required to achieve min. compaction requirements.

1. Maximum density and optimum water content as determined by the standard Proctor test (ASTM D 698). The moisture content and compaction should be measured for each lift of engineered fill during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved, with stability present.
2. For moisture levels of granular material, it is also appropriate to be conditioned at workable levels to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proof-rolled.

Grading and Drainage

All grades must provide effective drainage away from the construction area during and after construction and should be maintained throughout the life of the structure. The construction phase drainage should be considered in the development of the project overall grading and drainage plan. Poor drainage conditions can lead to instability in the areas around the lift station and hamper construction progress. The site grading and general contractor should consider their means and methods to maintain drainage during the construction phase.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the structures and equipment pads for at least 10 feet beyond the perimeter. After building construction, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted as necessary as part of the structure's maintenance program.

Mass Grading Considerations

The fill and residual soils encountered at most of the boring locations may be excavated with conventional construction equipment, such as a trackhoe.; however, PWR and auger refusal were encountered starting at about 15-1/2 feet deep beneath existing grades at B-1 and B-3. Auger

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refusal was encountered at a depth ranging from about 17 feet at B-1 and B-3 to 24 feet at Boring B-2. Rock coring at B-1 from 17 to 27 feet below existing grades revealed moderately weathered granitic gneiss rock. Due to the widely spaced borings performed, shallow PWR and/or bedrock material may also be encountered at differing elevations between and away from boring locations. Smaller equipment will have difficulty excavating PWR especially in the likely confined excavations. A large trackhoe equipped with an appropriately sized chipping hammer will likely be required at minimum to excavate some of these materials. Weathered rock especially in the deeper confined excavations will likely require blasting to efficiently excavate.

It is our opinion that a clear and appropriate definition of rock be included in the project specifications to reduce the potential for misunderstandings. A sample definition of rock for excavation specifications is provided below:

- *Mass Rock is defined as any material that cannot be dislodged by a Caterpillar D-8 Bulldozer, or equivalent, equipped with a single tooth ripper, without the use of impact hammers or drilling and blasting.*
- *Trench Rock is defined as any material that cannot be dislodged by a Caterpillar 325 hydraulic backhoe, or equivalent, without the use of impact hammers or drilling and blasting.*
- *Boulders or masses of rock exceeding ½ cubic yard in volume shall also be considered rock excavation. These classifications do not include materials such as loose rock, concrete, or other materials that can be removed by means other than impact hammering, but which for any reason, such as economic reasons, the Contractor chooses to remove by impact hammering.*

Cut and Fill Slopes

Our scope of service did not include an analysis of slope stability using laboratory derived shear strength data. However, in the Piedmont Physiographic Province, up to 15 feet tall cut and fill slopes are regularly constructed at inclinations of up to 2(H):1(V) and perform satisfactorily if properly constructed, and are not inundated or subject to ground water effects and or rapid draw down conditions.

Shallow sloughing at the surface can occur when slopes are not properly constructed or exposed to inclement weather prior to placement of a permanent vegetative cover. We recommend that fill slopes be over filled to about a 4H:1V projection and then cut back to develop an adequately compacted slope face rather than tracking in the slope face for compaction. At minimum, a protective vegetative cover incorporating erosion matting is recommended. However, given the relative difficulty in maintaining steep slopes, a permanent cover of rip rap over non-woven geotextile fabric (Mirafi 180N or equivalent) should be established as soon as practical. Some periodic maintenance of the slope face can be expected if a vegetative cover is specified.

Earthwork Construction Considerations

Groundwater was encountered in two of the borings at the time of field exploration and in a piezometer at B-1 after about 8 days at about 18 feet below existing grade (about Elevation 837 feet), which appears to be about coincident with the adjacent Lake Keowee level. Groundwater related excavation issues are expected at the site, and the groundwater table could rise and affect excavations, especially for the planned lift station and sewer man hole excavations. At minimum, a temporary dewatering system consisting of sumps with pumps will be necessary to achieve some depths of excavation. The designers should consider the depth to groundwater when setting the utility inverts and designing the lift station for hydrostatic uplift.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations. Temporary excavations will be required during grading operations. The grading contractor should be responsible for designing and constructing stable, temporary excavations and should dewater, shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. The contractor's dewatering plan should consider that the excavation will be performed below the level of Lake Keowee. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards. The contractor should provide an OSHA-defined authorized person on site to oversee these activities.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the design of contractor shoring, dewatering, or any of the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test should be performed for every 50 linear feet of compacted utility trench backfill.

In areas of any planned at grade foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

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In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

LIFT STATION DESIGN CONSIDERATIONS

The primary geotechnical considerations affecting the lift stations are excavation stability and resistance of the lift stations to hydrostatic uplift. Based on the results of the exploration, we anticipate that the planned excavations will be performed partially through loose silty to clayey sand fill and residual soils, into partially weathered rock and finally moderately weathered granitic gneiss. Groundwater is anticipated to be at levels close to the Lake Keowee level, but the contractor should verify the depth to water prior to beginning of excavation and shoring installation.

Based on the soil and groundwater conditions described above, the primary concern is difficult excavation to achieve the planned wet well and sewer manhole invert elevations. The contractor should be made aware that they are responsible for the analyses and selection of an excavation, sloping, shoring, and dewatering methods that will allow for the work to be completed in a safe and efficient manner consistent with the noted soil/rock and ground water conditions described herein and the requirements of the plans and specifications. The contractor should provide a submittal to the Engineer prior to start of construction that describes their planned installation procedures including their excavation/shoring design and dewatering plans.

Due to the anticipated weathered rock at the base of the planned lift station excavation, we anticipate relatively high allowable bearing pressures will be available. However, the maximum net allowable bearing pressure is defined as the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Accordingly, since the weight of the structure filled with water/sewage is expected to be less than the weight of the excavated soil, there would be no net increase of the pressure, in fact a reduction of pressure is expected. Therefore, bearing capacity or settlement of the lift station is not considered a concern. The subgrade at the bottom of the excavations is expected to be uneven from rock removal, so a minimum 6 inches of oriented/compacted open graded stone (i.e., #67 or #57) will be important to provide a stable and level work surface and to maintain the grade/invert of the sewer lift station and manhole bottoms. It should be noted that some small amount of settlement of the aggregate layer may occur during the removal of any temporary shoring, and this movement should be considered in the tolerances for the lift station invert. It is not unusual for a grout layer to be installed in the wet well interior bottom to account for this settlement.

Uplift of the lift stations from hydrostatic forces is perhaps the governing factor in design of the proposed structure. The uplift resistance for the lift stations is typically provided through a

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combination of the buoyant weight of the structure plus the buoyant weight of the backfill soils that are placed above the projection of the lift station base beyond the lift station perimeter. The buoyant weight of the concrete and compacted fill should be taken as 83 pcf and 58 pcf, respectively. The designer should evaluate that the lift stations design provides a minimum factor of safety of 1.5 for hydrostatic uplift considering highest likely groundwater level (i.e., highest lake level), and a minimum factor of safety of 1.2 for groundwater coincident with the ground surface.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations for generator pads and similar grade supported structures.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure ^{1, 2}	2,500 psf (foundations bearing within structural fill).
Required Bearing Stratum ³	Existing fill ⁷ Reddish brown, loose silty sand to clayey sand or structural fill.
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 18 inches
Ultimate Passive Resistance ⁴ (equivalent fluid pressures)	320 pcf (fine grained soil backfill) 360 pcf (granular backfill)
Ultimate Adhesion/Coefficient of Sliding Friction ⁵	0.30 (native fine grained soils) 0.33 (native granular soils) 0.38 (granular engineered fill)
Minimum Embedment Below Finished Grade ⁶	12 inches
Estimated Total Settlement from Structural Loads ²	Less than 1 inch.
Estimated Differential Settlement ²	About 1/2 of total settlement.

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Item	Description
1.	The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. These bearing pressures can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2.	Values provided are for maximum loads noted in Project Description . Settlement is for structural loads and up to 2 feet of engineering fill. Differential settlements are as measured over a span of 40 feet.
3.	Unsuitable or soft soils should be over-excavated and replaced per the recommendations in Earthwork .
4.	Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Apply a factor of safety of at least 1.5 to this value when designing for lateral force resistance.
5.	Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
6.	Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7.	Terracon has assumed the owner is willing to accept the risks associated with the existing fill; however, bearing the structure on existing fill is a business decision the owner must make. The inherent risks and recommendations regarding bearing the structure on existing fill can be found in the Existing Fill section presented in the Earthwork . Additional recommendations can be provided at the owners request if the owner elects not to accept the risks associated with the existing fill.

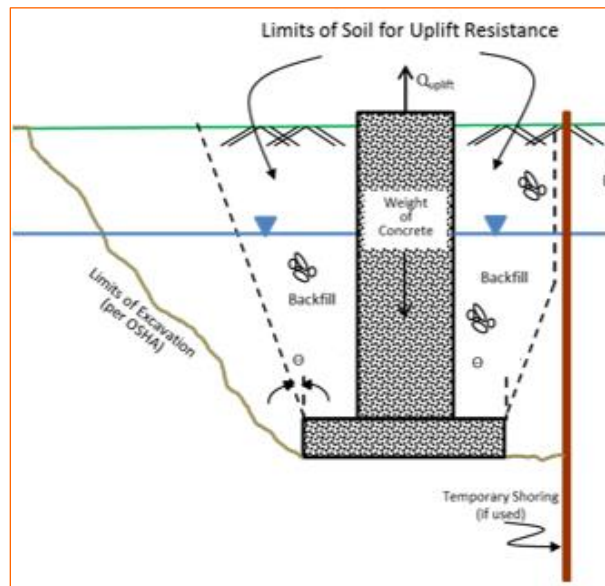
Design Parameters - Uplift Loads

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ , of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 115 pcf should be used for the backfill. This unit weight should be reduced to 58 pcf for portions of the backfill or natural soils below the groundwater elevation.

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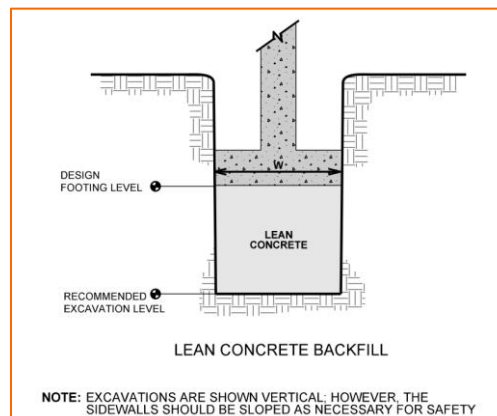
August 2, 2022 ■ Terracon Project No. 86225088



Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



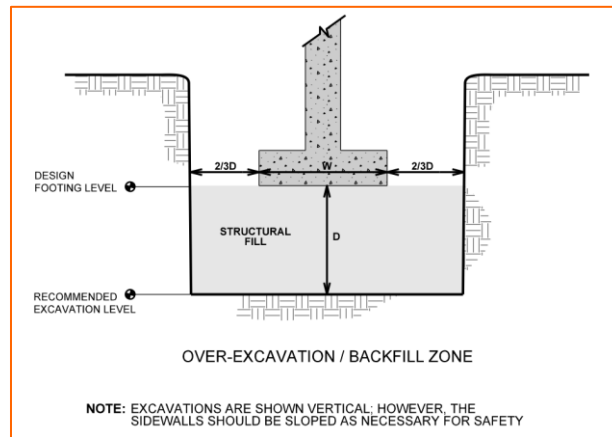
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Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with structural soil fill or crushed stone wrapped in non-woven geotextile fabric, placed as recommended in the **Earthwork** section.



The following precautions are essential to the satisfactory performance of shallow foundations:

- Provide positive drainage away from the foundations, both during and after construction.
- Avoid excavations during inclement weather and place concrete within the excavations within 24 hours after completion of the excavations.
- Verify that the excavations are completely within the required bearing stratum or structural fill and remove and replace any unacceptable soils as discussed herein.
- Maintain adequate moisture levels in exposed excavation and slab subgrades, but do not allow the areas to become saturated.
- Place a “mudmat” of lean concrete to seal the bearing stratum in the event wet conditions are experienced or expected.
- Minimize traffic in excavations to only that necessary to place the steel and concrete for the footings.
- Remove free water in the excavations prior to placing concrete.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-16.

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Code Used	Site Classification
2018 International Building Code (IBC) ¹	C ²

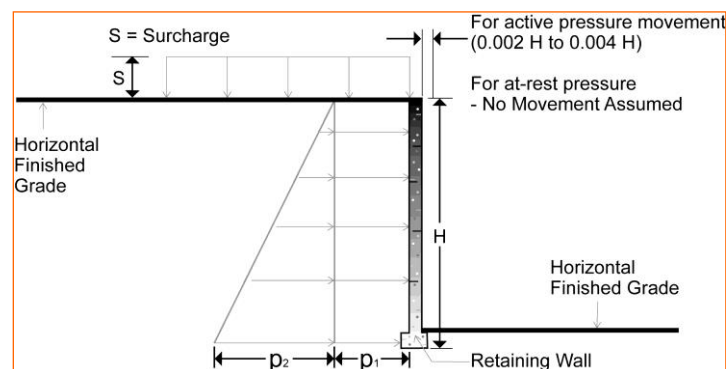
1. In general accordance with the 2018 International Building Code.
2. The 2018 International Building Code (IBC) requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100-foot soil profile determination. Borings for the proposed structure extended to a maximum depth of approximately 27 feet and this seismic site class definition considers that moderately weathered rock extends below the maximum depth of the subsurface exploration. Deeper exploration could be performed to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a higher seismic site class.

Seismic considerations may not control the structural design of buildings in South Carolina (as compared to wind loading conditions). The seismic site classification provided was based on SPT test results. Establishing the seismic site class using shear wave velocity profile is considered more precise. If seismic considerations control the structural design, we can provide a proposal to perform additional services to measure shear wave velocity such as MASW (multichannel analysis of surface waves) or ReMi testing (refraction microtremor).

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, lift stations or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



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Lateral Earth Pressure Design Parameters				
Earth Pressure Condition ¹	Coefficient for Backfill Type ²	Surcharge Pressure ^{3, 4, 5} p_1 (psf)	Effective Fluid Pressures (psf) ^{2, 4, 5}	
			Unsaturated ⁶	Submerged ⁶
Active (Ka)	Granular - 0.33	(0.33)S	(40)H	(80)H
	Fine Grained - 0.38	(0.38)S	(46)H	(85)H
At-Rest (Ko)	Granular - 0.50	(0.50)S	(60)H	(90)H
	Fine Grained - 0.54	(0.54)S	(65)H	(95)H
Passive (Kp)	Granular - 3.00	---	(360)H	(250)H
	Fine Grained - 2.66	---	(320)H	(205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf. Granular assumes imported sand material with not more than 10% passing the No. 200 sieve. Site soils should be considered fine grained for lateral pressure purposes.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

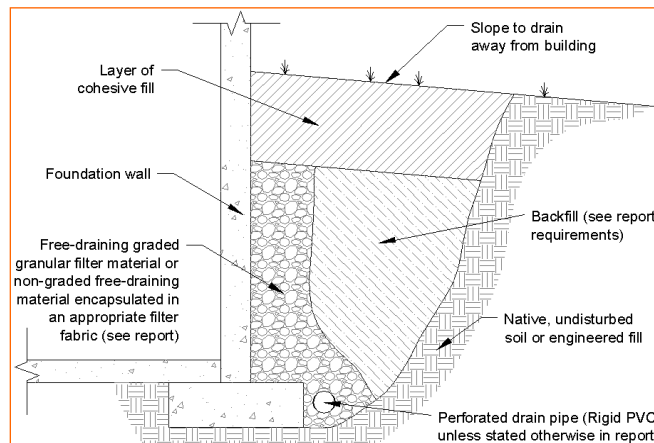
Subsurface Drainage for Below-Grade Walls

Where practical, a perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5 percent passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.

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As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

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Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

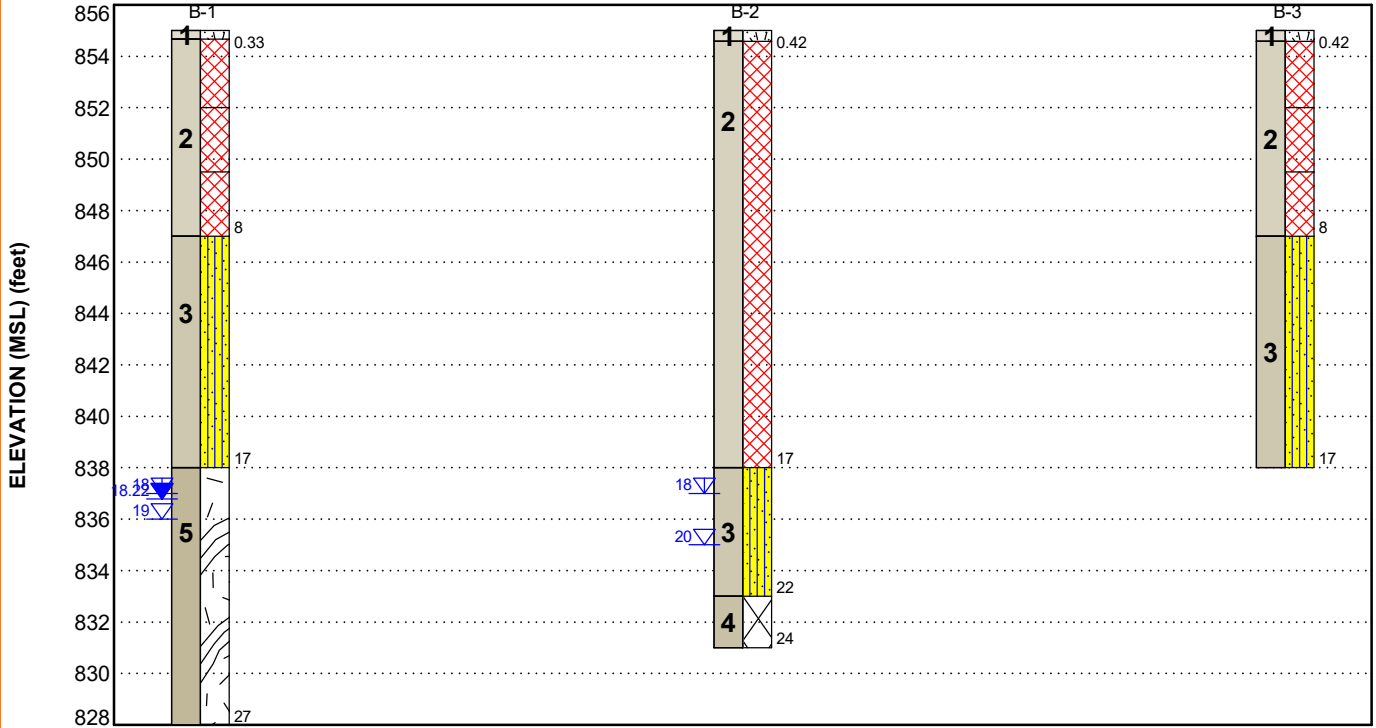
FIGURES

Contents:

GeoModel

GEOMODEL

Flat Rock PS Replacement ■ Walhalla, SC
Terracon Project No. 86225088



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil	Organic laden soils, typically 5 inches thick where encountered.
2	Fill	Classified as silty sand to clayey sand w/ rock fragments. Variable consistency and slightly compact w/ SPT Values typically around 4 bpf.
3	Residual Soils	Typically classified as fine to coarse grained silty sand, loose to medium dense.
4	Partially Weathered Rock	Material sampled as very dense silty sand. Encountered in boring B-2 from 22 to 24 ft below ground surface. Hard drilling noted below about 15-1/2 ft at borings B-1 and B-3. Auger refusal encountered at depth of about 17 ft at B-1 and B-3 and 24 ft at boring B-2. Rock cores at Boring B-1 indicated moderately weathered granitic gneiss rock.
5	Bedrock	

LEGEND

- Topsoil
- Fill
- Silty Sand
- Gneiss
- Weathered Rock

- First Water Observation
- Second Water Observation
- Third Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Locations	Type of Exploration	Exploration Depth (feet)	Drilled Location
2	Borings	17 to 24	Lift station
1	Boring with 10-ft Rock Core	27	

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout at locations selected by KCI. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ± 20 feet) and approximate elevations were estimated from the sketch provided by KCI. The accuracy of the ground surface at each point is probably about ± 1 feet. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted, mounted rotary drill rig using continuous hollow stem augers to a depth of around 17 to 24 feet. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings or cement-bentonite grout, consistent with state regulations, upon completion. Pavements were patched with cold-mix asphalt and/or pre-mixed concrete, as appropriate.

At boring location B-1 after reaching auger refusal, rock coring was performed using an NQ-wire line core barrel. We performed two 5-ft core runs and stored the rock cores in wax impregnated boxes. The percent recovery and the RQD was then determined for each of the 5-ft core runs.

A PVC piezometer was installed at boring location B-1 to a depth of 20 feet and included about 15 feet of screen that was backfilled with sand and sealed to the surface with bentonite chips.

The sampling depths, penetration distances, rock recovery, RQD and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface

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conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory. Unless otherwise notified by the client, samples will be disposed after 90 days from date of exploration.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- ASTM D2938 Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens (Withdrawn 2005)

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan

Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

Flatrock Lift Station ■ Walhalla, Oconee County, SC
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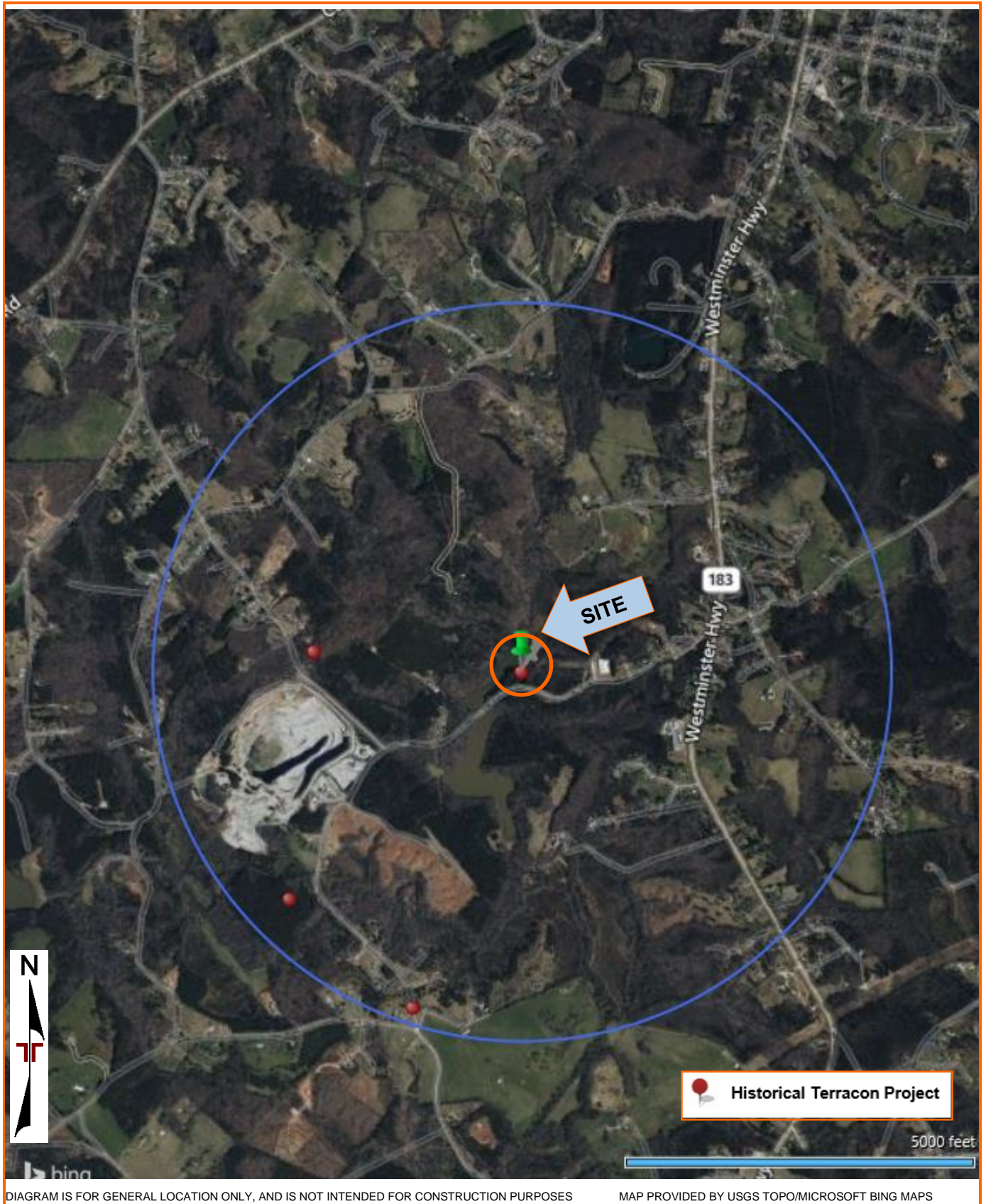


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY USGS TOPO/MICROSOFT BING MAPS

EXPLORATION PLAN

Flatrock Lift Station ■ Walhalla, Oconee County, SC

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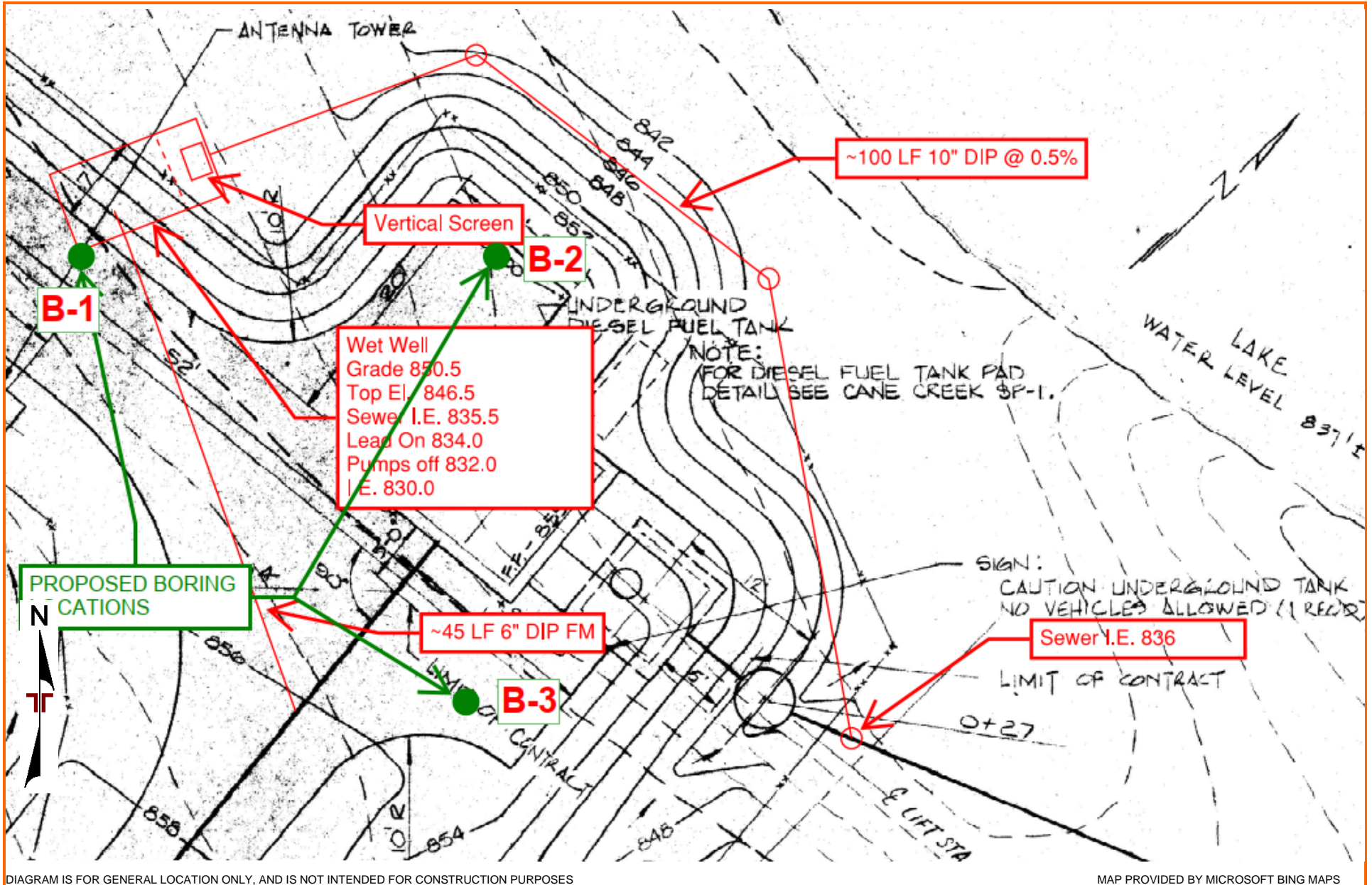


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs, B-1 through B-3 (3 pages)

Rock Core Photographs, B-1

Summary of Laboratory Results

Grain Size Curves

Note: All attachments are one page unless noted above.

CORING LOG NO. B-1

PROJECT: Flat Rock PS Replacement

CLIENT: KCI Technologies, Inc.
Piedmont, SC

SITE: 190 Duck Pond Road
Walhalla, SC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 34.7322° Longitude: -83.0815° Approximate Surface Elev.: 855 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	PERCENT FINES
1		0.3 - TOPSOIL , 4 inches	854.7+/-						
2		FILL - SILTY SAND (SM) , with mica, fine to coarse grained, red orange and brown, some rock fragments	3.0			4-8-6 N=14	SS-1	20.4	
		FILL - CLAYEY SAND (SC) , with mica, fine to coarse grained, red with brown, some rock fragments	5.5			2-2-3 N=5	SS-2	18.2	42
		FILL - SILTY SAND (SM) , with mica, clay, and roots, fine to coarse grained, red with brown and gray	8.0			2-2-2 N=4	SS-3	18.0	
3		RESIDUAL-SILTY SAND (SM) , fine to coarse grained, red orange and brown, loose	849.5+/-			8-5-4 N=9	SS-4	14.7	
		Rocky drilling encountered between 11 feet and 13 feet below ground surface.							
		fine to coarse grained, white and gray, dense, with rock fragments							
5		Rocky drilling encountered between 15 1/2 feet and 17 feet below ground surface.	17.0			11-14-16 N=30	SS-5	7.2	
		GRANITIC GNEISS , white and gray, extremely close to close fracture spacing, moderately weathered, weak rock	838+/-						
		19.5 feet - Unconfined Compressive Strength = 3,377 psi				REC=73% RQD=25%	R-1		
		white and gray, extremely close to moderate fracture spacing, moderately weathered, strong rock							
		24 feet - Unconfined Compressive Strength = 8,462 psi				REC=65% RQD=16%	R-2		
		Coring Terminated at 27 Feet	828+/-						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" Hollow Stem Auger
NQ wireline core barrel

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

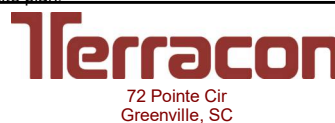
Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

- ▽ While drilling
- ▽ At completion of drilling
- ▼ After 8 days



Boring Started: 07-06-2022

Boring Completed: 07-06-2022

Drill Rig: Geoprobe 3126 GT

Driller: B. Burnette

Project No.: 86225088

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_86225088 FLAT ROCK PS REPL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/22

BORING LOG NO. B-2

PROJECT: Flat Rock PS Replacement

CLIENT: KCI Technologies, Inc.
Piedmont, SC

SITE: 190 Duck Pond Road
Walhalla, SC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 34.7322° Longitude: -83.0814° Approximate Surface Elev.: 855 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	PERCENT FINES
1		TOPSOIL , 5 inches	0.4						
2		FILL - SILTY SAND (SM) , with mica, roots, some clay, fine to coarse grained, red and brown, with rock fragments with mica, fine to coarse grained, red and brown, some rock fragments No recovery, spoon blocked by rock fragment. with mica, clay, organics, fine to medium grained, red with gray, some rock fragments	17.0			1-1-2 N=3	SS-1	14.9	
						3-3-4 N=7	SS-2	14.7	
						2-4-5 N=9	SS-3	10.2	
						5-7-4 N=11	SS-4		
						1-1-2 N=3	SS-5	24.3	41
3		RESIDUAL-SILTY SAND (SM) , with mica, fine to medium grained, red orange, brown, and white, medium dense	22.0	▽		9-8-4 N=12	SS-6	16.8	
4		PARTIALLY WEATHERED ROCK SAMPLED AS SILTY SAND (SM) , fine to coarse grained, gray and red orange, very dense, with rock fragments	24.0			50/3" N=50/3"	SS-7	15.5	
		Auger Refusal at 24 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

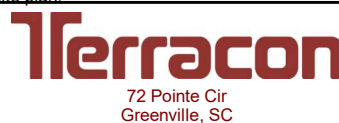
Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

- ▽ While drilling
- ▽ At completion of drilling



Boring Started: 07-06-2022

Boring Completed: 07-06-2022

Drill Rig: Geoprobe 3126 GT

Driller: B. Burnette

Project No.: 86225088

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_86225088 FLAT ROCK PS REPL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/22

BORING LOG NO. B-3

PROJECT: Flat Rock PS Replacement

CLIENT: KCI Technologies, Inc.
Piedmont, SC

SITE: 190 Duck Pond Road
Walhalla, SC

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 34.7321° Longitude: -83.0814° Approximate Surface Elev.: 855 (Ft.) +/- ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	PERCENT FINES
1		0.4 TOPSOIL , 5 inches	854.6+/-						
2		FILL - SILTY SAND (SM) , with mica, roots, some clay, fine to medium grained, red and brown	3.0		X	2-2-2 N=4	SS-1	25.7	34
		FILL - SANDY LEAN CLAY (CL) , with mica, organics, red and gray, some rock fragments	5.5		X	2-3-3 N=6	SS-2	17.7	
		FILL - CLAYEY SAND (SC) , with mica, organics, fine to medium grained, red and gray, some rock fragments	8.0		X	2-2-3 N=5	SS-3	19.2	
3		RESIDUAL-SILTY SAND (SM) , with mica, fine to medium grained, red with brown, medium dense	847+/-		X	6-5-5 N=10	SS-4	18.9	
		Rocky drilling encountered between 16 feet and 17 feet below ground surface	17.0	838+/-		X	3-5-7 N=12	SS-5	21.8
		Auger Refusal at 17 Feet				50/0" N=50/0"			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
2 1/4" Hollow Stem Auger

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:

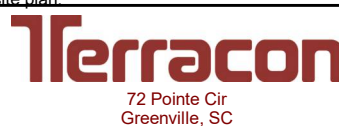
Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

WATER LEVEL OBSERVATIONS

No free water observed



Boring Started: 07-06-2022

Boring Completed: 07-06-2022

Drill Rig: Geoprobe 3126 GT

Driller: B. Burnette

Project No.: 86225088

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_86225088 FLAT ROCK PS REPL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/22

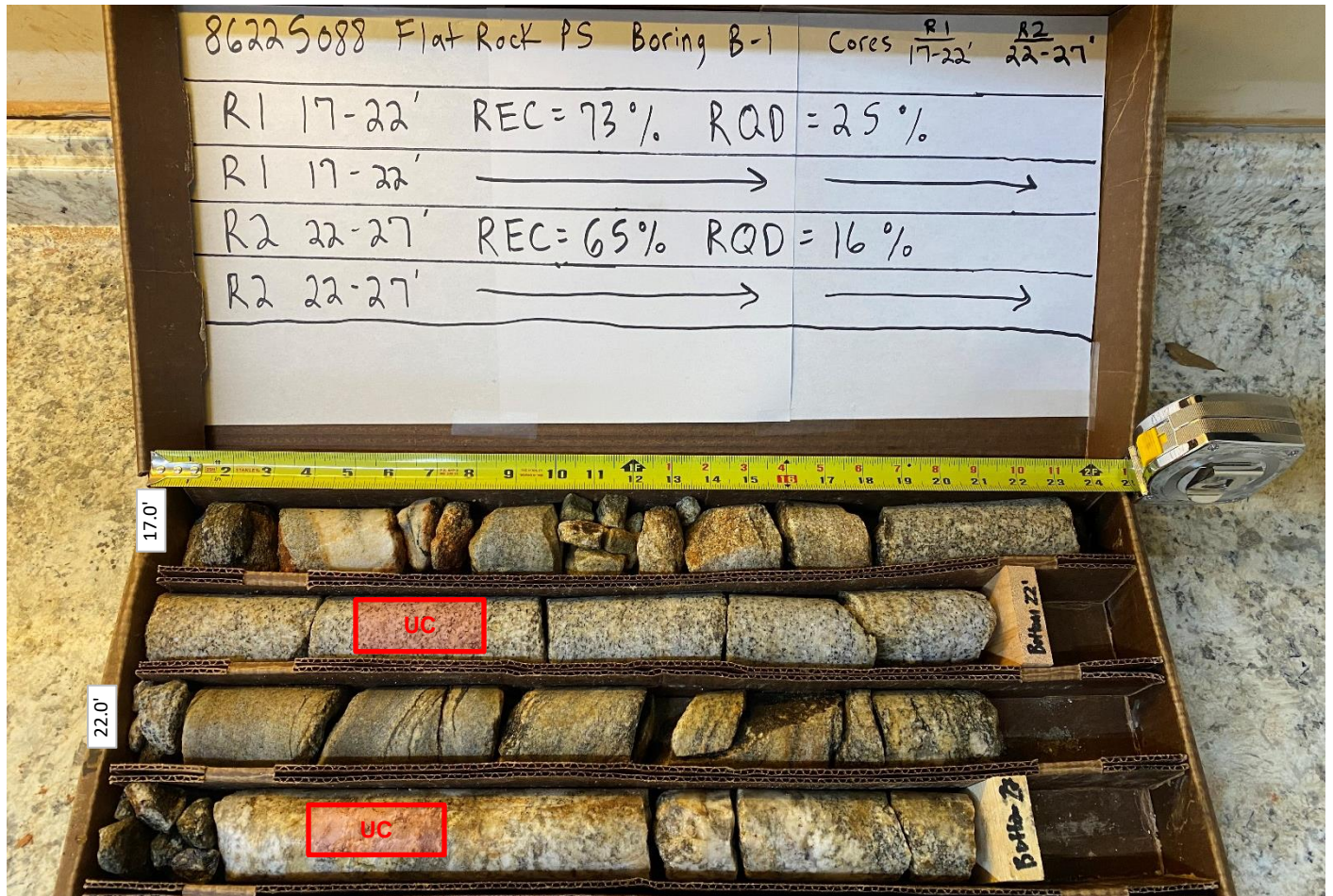
ROCK CORE PHOTOGRAPHS

Flat Rock PS Replacement ■ Walhalla, South Carolina
 July 26, 2022 ■ Terracon Project No. 86225088



Site Description: Flat Rock PS Replacement	County: Oconee	Boring Location: B-1
Driller: B. Burnette	Core Size: NQ	Drill Machine: GeoProbe 3126 GT
Geologist / Engineer: M. McKenney	Total Core Length: B-1: 10 feet	Date: 07/26/2022

B-1 - Run 1: 17.0' to 22.0', Run 2: 22.0' to 27.0'



Notes:

- 1) Used NQ wireline core barrel
- 2) Refer to boring log for results of unconfined compressive (UC) strength test. Performed in general accordance with ASTM D2938.



72 Pointe Circle
 Greenville, South Carolina

Abandonment Method:
 Boring backfilled with auger cuttings upon completion.

Summary of Laboratory Results

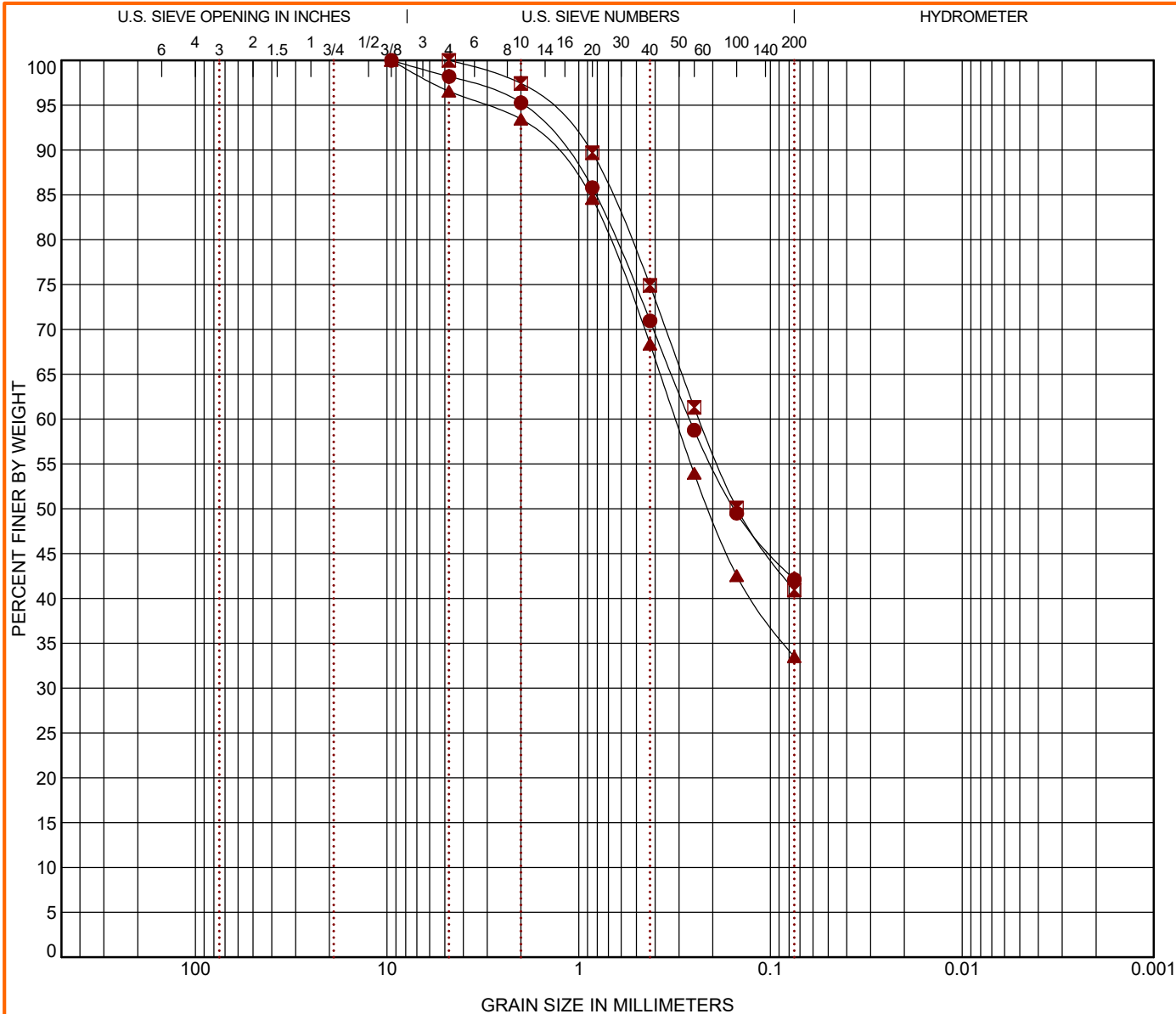
BORING ID	Depth (Ft.)	Soil Classification USCS	% Gravel	% Sand	% Fines	Water Content (%)
B-1	1-2.5	SILTY SAND				20.4
B-1	3.5-5	CLAYEY SAND	1.8	56.1	42.1	18.2
B-1	6-7.5	SILTY SAND				18.0
B-1	8.5-10	SILTY SAND				14.7
B-1	13.5-15	SILTY SAND				7.2
B-2	1-2.5	SILTY SAND				14.9
B-2	3.5-5	SILTY SAND				14.7
B-2	6-7.5	SILTY SAND				10.2
B-2	13.5-15	SILTY SAND	0.0	59.1	40.9	24.3
B-2	18.5-20	SILTY SAND				16.8
B-2	23.5-23.75	SILTY SAND				15.5
B-3	1-2.5	SILTY SAND	3.4	63.1	33.5	25.7
B-3	3.5-5	SANDY LEAN CLAY				17.7
B-3	6-7.5	CLAYEY SAND				19.2
B-3	8.5-10	SILTY SAND				18.9
B-3	13.5-15	SILTY SAND				21.8

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT 86225088 FLAT ROCK PS REPL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/22

PROJECT: Flat Rock PS Replacement	<p style="font-size: small; margin: 0;">72 Pointe Cir Greenville, SC</p>	PROJECT NUMBER: 86225088
SITE: 190 Duck Pond Road Walhalla, SC		CLIENT: KCI Technologies, Inc. Piedmont, SC

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● B-1	3.5 - 5	CLAYEY SAND (SC)	18.2					
■ B-2	13.5 - 15	SILTY SAND (SM)	24.3					
▲ B-3	1 - 2.5	SILTY SAND (SM)	25.7					

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● B-1	3.5 - 5	9.5	0.264			0.0	1.8	56.1		42.1	
■ B-2	13.5 - 15	4.75	0.235			0.0	0.0	59.1		40.9	
▲ B-3	1 - 2.5	9.5	0.312			0.0	3.4	63.1		33.5	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 86225088 FLAT ROCK PS REPL.GPJ TERRACON_DATATEMPLATE.GDT 7/29/22

PROJECT: Flat Rock PS Replacement

SITE: 190 Duck Pond Road
Walhalla, SC



PROJECT NUMBER: 86225088

CLIENT: KCI Technologies, Inc.
Piedmont, SC

SUPPORTING INFORMATION

Contents:

General Notes

Unified Soil Classification System







Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Flat Rock PS Replacement ■ Walhalla, SC

Terracon Project No. 86225088

SAMPLING	WATER LEVEL	FIELD TESTS
 Rock Core  Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION
<p>Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.</p>

LOCATION AND ELEVATION NOTES
<p>Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.</p>

STRENGTH TERMS				
RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG
<p>The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.</p>

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $[Cc < 1$ or $Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $[Cc < 1$ or $Cc > 3.0]$ ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A" line ^J	CL	Lean clay ^{K, L, M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}
			Liquid limit - not dried		Organic silt ^{K, L, M, O}	
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}	
			PI plots below "A" line	MH	Elastic Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
			Liquid limit - not dried		Organic silt ^{K, L, M, Q}	
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains $\geq 15\%$ sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains $\geq 30\%$ plus No. 200 predominantly sand, add "sandy" to group name.

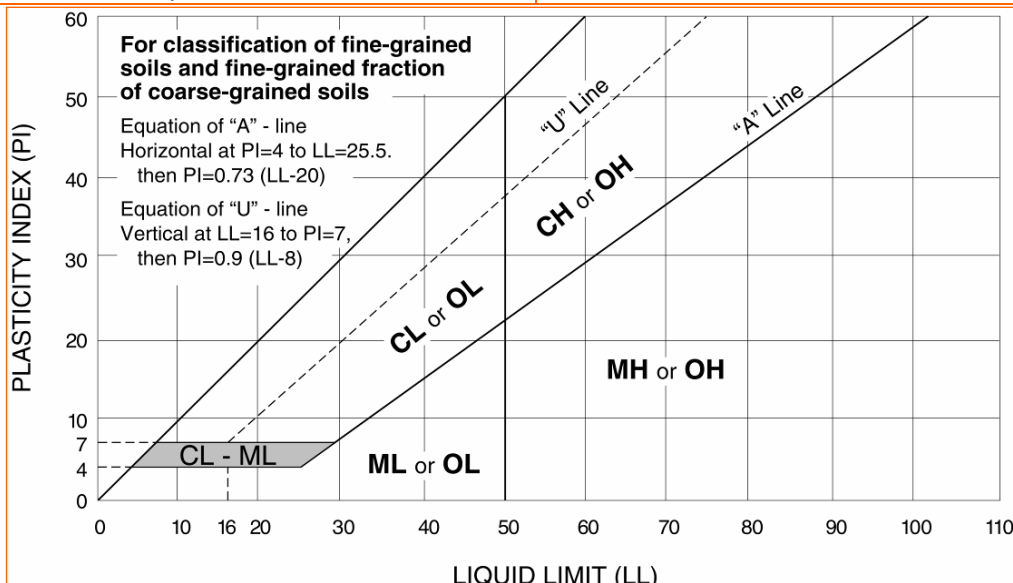
^M If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



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