

Bidding Documents
for
WYCKOFF WTP
CLEARWELL #3

May 2020

Owner:

Cobb County-Marietta Water Authority
1170 Atlanta Industrial Dr.
Marietta, Georgia 30066
(770) 514-5300

Engineer:

Engineering Strategies, Inc.
3855 Shallowford Rd., Suite 525
Marietta, GA 30062
(770) 429-0001



TABLE OF CONTENTS

SECTION NO. SECTION TITLE

GENERAL PROVISIONS

00 11 13	Advertisement for Bid
00 21 13	Instructions to Bidders
00 31 46	Permits and Easements
00 41 13	Bid Form
00 41 15	Statement of Bidder's Qualifications
00 43 13	Bid Bond
00 45 19	Non-Collusion Affidavit of Bidder
00 45 43	Corporate Certificate
00 45 44	Contractor's License Certification
00 45 46	Affidavit Verifying Status
00 45 47	Security and Immigration Compliance Act Certification
00 45 48	Contractor Affidavit and Agreement
00 45 49	Subcontractor Affidavit and Agreement
00 45 50	Sub-subcontractor Affidavit and Agreement
00 51 50	Notice of Award
00 52 00	Agreement Between Owner and Contractor
00 54 14	Pre-construction Oath
00 55 00	Notice to Proceed
00 61 14	Performance Bond
00 61 15	Payment Bond
00 62 14	Certification of Contractor's Attorney
00 62 15	Certification of Owner's Attorney
00 62 16	Insurance Certificate Checklist
00 65 19	Contract Completion Affidavit
00 72 00	General Conditions
00 73 00	Supplementary Conditions

TECHNICAL PROVISIONS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 20 00	Approved Suppliers of Services
----------	--------------------------------

DIVISION 01 – GENERAL REQUIREMENTS

01 11 00	Summary of Work
01 21 00	Allowances
01 29 76	Progress Payment Procedures



TABLE OF CONTENTS (Continued)

01 31 13	Project Coordination
01 31 19	Project Meetings
01 32 16	Construction Schedules
01 33 00	Submittals
01 35 13	Special Project Procedures
01 35 13.53	Maintenance of Utility Operations During Construction
01 35 25	Confined Space Entry
01 35 53	Job Site Security
01 45 29	Quality Control
01 45 33	Special Inspections
01 51 00	Temporary Utilities
01 52 00	Field Offices, Equipment and Services
01 56 17	Dust Control and Property Protection
01 57 13	Temporary Erosion and Sediment Control
01 60 00	Materials and Equipment
01 61 00	Transportation and Handling
01 61 13	Asset Registry
01 62 00	Storage and Protection
01 70 00	Project Closeout
01 71 23.16	Construction Surveys and Staking
01 78 00	Closeout Submittals
01 78 23	Operation and Maintenance Manuals
01 78 36	Warranties

DIVISION 02 – EXISTING CONDITIONS

02 01 00	Maintenance of Existing Conditions
02 32 13	Subsurface Conditions
02 41 13	Demolition and Removal of Existing Structures and Equipment

DIVISION 03 – CONCRETE

03 01 32	Modification and Repair to Concrete
03 11 00	Concrete Forming
03 15 00	Concrete Accessories
03 20 00	Concrete Reinforcement
03 30 00	Cast-In-Place Concrete
03 35 00	Concrete Finishes
03 60 00	Grouting
03 90 00	Leakage Testing of Water Retaining Structures



TABLE OF CONTENTS (Continued)

DIVISION 05 – METALS

05 01 00	Metal Materials
05 05 23	Metal Fastening
05 14 00	Structural Aluminum
05 51 00	Metal Stairs
05 52 00	Metal Railings
05 55 00	Metal Treads and Nosing

DIVISION 09 – FINISHES

09 91 00	Painting
----------	----------

DIVISION 26 – ELECTRICAL

26 00 00	General Electrical Provisions
26 05 05	Wire and Cable (600V)
26 05 26	Grounding and Bonding
26 05 33	Conduit
26 05 43	Underground Ducts and Raceways for Electrical Systems
26 08 00	Acceptance Testing and Calibration
26 24 16	Panelboards

DIVISION 31 – EARTHWORK

31 11 00	Site Preparation
31 23 13	Subgrade Preparation
31 23 16	Excavation
31 23 19	Construction Dewatering
31 23 23	Fill and Backfill
31 32 00	Soil Stabilization
31 32 19.16	Geotextile
31 37 00	Rip Rap

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 12 16	Asphalt Concrete Paving
32 92 00	Grassing and Mulching

DIVISION 33 – UTILITIES

33 05 16.13	Precast Concrete Structures
33 05 24	Steel Pipe
33 11 13	Water Main Construction
33 11 36	Sample Pumps
33 41 01	Storm Drain Piping
33 44 13.13	Catch Basins



TABLE OF CONTENTS (Continued)

DIVISION 40 – PROCESS INTERCONNECTIONS

40 05 65	Small Valves and Appurtenances
40 27 02	Butterfly Valves
40 90 00	ICMS General Requirements
40 90 01	ICMS Testing Requirements



ADVERTISEMENT FOR BID

Sealed Bids will be received by the Cobb County-Marietta Water Authority at 1170 Atlanta Industrial Drive, Marietta, Georgia 30066 until:

11:00 AM, local prevailing time
on
Wednesday, July 1, 2020

for the Project known as:

WYCKOFF WTP CLEARWELL #3

Due to the ongoing COVID-19 epidemic, Cobb County-Marietta Water Authority's mail service has been discontinued at their main offices and they have limited administration staff working at this time. In order to ensure that all bid packages are received by the due date and time, Cobb County-Marietta Water Authority requires all bid packages to be hand-delivered on June 30, 2020 from 1 PM to 5 PM EST or on July 1, 2020 from 8 AM to 11 AM EST. Bids received after the designated time will not be considered. The bids packages will be opened by a representative of the Engineer and witnessed by at least one representative of the Owner and a summary of the submitted bids will be sent by email to all Bidders. Bidders or the public may not attend the bid opening.

The Owner of the project is Cobb County-Marietta Water Authority. The Engineer for the Project is Engineering Strategies, Inc. Bid opening time is subject to extension pursuant to O.C.G.A Section 36-91-20(d).

The approximate extent and character of the Work is generally described as follows:

Construction of new 6 million-gallon cast-in-place concrete clearwell, 84-inch yard piping and appurtenances.

The minimum requirements for a Bidder to qualify for this project are successful completion of the construction and commissioning of at least two cast-in-place concrete water-retaining structures with minimum water-retaining volume of 1,500,000 gallons each and successful completion of the construction or installation and commissioning of at least two water or wastewater treatment plant piping components of minimum diameter of 42 inches. Each of these two projects must have been completed by the Bidder after January 1, 2005.

Bidders shall inform themselves concerning Georgia Laws and comply with same.

A mandatory pre-bid meeting will be held for all Bidders at the Hugh A. Wyckoff Water Treatment Plant, 3728 Mars Hill Road, Acworth, GA 30101 on Wednesday, June 17, 2020 at 10:30 AM. Attendance is mandatory for all bidders. The pre-bid meeting will be held outside buildings near the elevated wash water tower. Attendance will be limited to one person per company and each person must wear a face mask.



Bidding Documents are available for examination and purchase at the Issuing Office which is Engineering Strategies, Inc. 3855 Shallowford Rd., Suite 525, Marietta, GA 30062, Phone (770) 429-0001. Cost of Bid Documents is \$150.00 for each set, payable to Engineering Strategies, Inc.

By purchasing the Contract Documents, purchaser agrees to have its company name, address, phone and fax numbers published as a plan holder.

The Owner is not obligated to consider a Bidder's proposal, if Bidder is not on record with the Issuing Office as having received a complete set of Bidding Documents from the Issuing Office.

The time allowed for Substantial Completion is 540 consecutive calendar days, and the time allowed for final completion and readiness for final payment is 570 consecutive calendar days from the date of commencement.

Each bid must be submitted on the bid form in the contract documents, in accordance with the Instructions to Bidders. No interlineations, additions or deletions shall be made in the bid form by the Bidder. Each bid must be accompanied by a Bid Bond with good and sufficient surety or sureties approved by the Owner for faithful acceptance of the contract, payable to, in favor of, and for the protection of the Owner in an amount equivalent to five percent (5%) of the total amount payable by the terms of the contract or, in lieu thereof, a certified check, cashier's check, or cash in equal amount. Each Bid must also be accompanied by a notarized non-collusion affidavit for the Bidder. Out-of-state corporations and other entities must submit evidence of authority to conduct business in Georgia as an out-of-state entity.

The Owner will in no way be liable for any costs incurred by any Bidder in the preparation of its Bid in response to this Advertisement for Bid.

The successful Bidder will be required to furnish performance and payment bonds with the executed Agreement meeting the requirements of the Contract Documents and executed on the forms attached to the Agreement. The successful Bidder will also be required to furnish an oath pursuant to O.C.G.A. §36-91-21 from every person who procures the Agreement. The terms and time for payment are set forth in the Agreement.

All Bids will remain subject to acceptance for sixty days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date.

The Owner reserves the right to reject all Bids, to waive informalities and re-advertise.

Cobb County-Marietta Water Authority
Glenn M. Page, P.E.
General Manager

- END OF SECTION -



INSTRUCTIONS TO BIDDERS

1. Defined Terms

Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Contract have the meanings assigned to them in the General Conditions.

Certain additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof.

- 1.1. Bidder - one who submits a Bid directly to Owner as distinct from a sub-bidder, who submits a bid to a Bidder.
- 1.2. Issuing Office - the office named in the Advertisement for Bid from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
- 1.3. Successful Bidder - the lowest, responsible and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.
- 1.4. Owner - Cobb County-Marietta Water Authority (CCWMA), party of the first part to the Contract Agreement, or its authorized and legal representatives.
- 1.5. Engineer - The individual or entity named as such in the Advertisement for Bids and Agreement.
- 1.6. Contractor - the party of the second part to the Contract Agreement or the authorized and legal representative of such party.
- 1.7. Work and Project - shall mean the entire complete construction required to be furnished under the Contract Documents.
- 1.8. Products - shall mean materials or equipment permanently incorporated into the Project.
- 1.9. Provide - shall mean to furnish and install.

2. Copies of Bidding Documents

- 2.1. Complete sets of the Bidding Documents may be obtained from the Issuing Office. Bidding Documents are open for inspection to prospective bidders at the Issuing Office for the purpose of review in order to determine if the prospective bidders wish to obtain Bidding Documents.
- 2.2. Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents, whether obtained from the Owner, Engineer, Issuing Office, or other sources.



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

3. Qualifications of Bidders

- 3.1. Owner reserves the right to reject any Bidder who does not satisfy the Owner as to its ability to successfully perform the Work.
- 3.2. To demonstrate current qualifications to perform the Work, each Bidder must submit with the bid detailed written evidence, such as previous experience, present commitments and other such data as defined in the Statement of Bidder's Qualifications (SBQ). Failure to supply all the requested information may deem the Bid unresponsive.
- 3.3. The Bidder will be required to provide evidence of compliance with the requirements of OCGA 43 - 14 and OCGA 43 - 41 (Construction Industry Licensing Board Acts and Rules and Regulations) with respect to the requirements of the code.
- 3.4. Bidder shall be a licensed Utility Contractor in the State of Georgia at the time Bids are submitted. Contractors and Subcontractors must be licensed by the State Construction Industry Licensing Board, Ga Rules and Regulations 121-6.02.
- 3.5. The Owner may make such investigations as it deems necessary to determine the ability of the Bidder to perform the work and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request, including information on subcontractors that are intended to perform work on the project. By submission of his bid, the Bidder acknowledges the right of the Owner to make such investigations, to contact references and utilize this information as a basis of determining award of the contract. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.
- 3.6. The minimum experience criteria to be considered a responsible Bidder are as follows:
 - 3.6.1. Successful completion of the construction and commissioning of at least two cast-in-place concrete water-retaining structures with minimum water-retaining volume of 1,500,000 gallons each;
 - 3.6.2. Successful completion of the construction or installation and commissioning of at least two water or wastewater treatment plant piping components of minimum diameter of 42 inches;
 - 3.6.3. Each of these two projects must have included installation and commissioning activities performed by the Bidder;
 - 3.6.4. Each of these two projects must have been completed after January 1, 2005.
- 3.7. Key Personnel - The Bidder must demonstrate that the proposed Project Manager and Project Superintendent shall meet the following criteria: The proposed Project Manager and the proposed Project Superintendent shall have been involved in at least one of the listed projects described in 3.6.1 above; it is not necessary that both the proposed Project Manager and the proposed Project Superintendent were involved in the same Project from those described in



3.6.1 above. The Owner reserves the right to reject any proposed Project Managers or Project Superintendents that are proposed for the Work.

- 3.8 Adequate demonstration of the above listed project qualifications for the Bidder and specialty subcontractor, if required, shall be provided at the time of bid on the Statement of Bidder's Qualifications form contained in these Specifications with accompanying company resumes, marketing brochures and individual project descriptions as required. Current reference names and contact telephone numbers shall be provided at the time of bid for the listed projects. Adequate demonstration of the qualification of the proposed Project Manager and Project Superintendent shall be provided at the time of bid in the form of personnel resumes.

The Bidder shall, as a part of its Bid, submit a list of similar projects it has successfully completed with a contact reference for each project. The contact reference shall be a current employee of the Owner of that project. The Bidder shall also provide, for the projects mentioned above and the proposed Project Superintendent, any history of litigation, arbitration, or other related mediation actions. All project experience information shall be required to be notarized.

4. Examination of Contract Documents and Site

- 4.1. It is the responsibility of each Bidder before submitting a Bid:
- 4.1.1. To examine thoroughly the Contract Documents and other related data identified in the Bidding Documents (including "technical data" referred to below);
 - 4.1.2. To visit the site to become familiar with and satisfy Bidder as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work; due to issues with the current COVID-19 disease, Bidder will be allowed to visit the plant only for the mandatory pre-bid meeting;
 - 4.1.3. To consider federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work;
 - 4.1.4. To study and carefully correlate Bidder's knowledge and observations with the Contract Documents and such other related data; and
 - 4.1.5. To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Contract Documents and such other related documents.
- 4.2. Reference is made to the Supplementary Conditions for identification of:
- 4.2.1. Those reports of explorations and tests of subsurface conditions at or contiguous to the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the general accuracy of the "technical data" contained in such reports but not upon other data, interpretations, opinions or information contained in such reports or otherwise relating to the subsurface conditions at the site, nor upon the completeness thereof for the purposes of bidding or construction.
 - 4.2.2. Those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the site that have



been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the general accuracy of the “technical data” contained in such drawings but not upon other data, interpretations, opinions or information shown or indicated in such drawings or otherwise relating to such structures, nor upon the completeness thereof for the purposes of bidding or construction.

- 4.2.3. Copies of such reports and drawings will be made available for review to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph SC-4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion drawn from any “technical data” or any such data, interpretations, opinions or information.
- 4.3. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities or others, and Owner and Engineer do not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.
- 4.4. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Contract Documents due to differing or unanticipated conditions appear in Paragraphs 4.02 and 4.03 of the General Conditions.
- 4.5. Before submitting a Bid each Bidder will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be employed by Bidder and safety precautions and programs incident thereto or which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents.
- 4.6. Owner usually would provide each Bidder access to the site to conduct such examinations, investigations, explorations, tests and studies as each Bidder deems necessary for submission of a Bid. However, due to current issues with the COVID-19 disease, access to the site will be limited to attendance to the mandatory pre-bid meeting.
- 4.7. Reference is made to the Supplementary Conditions for the identification of the general nature of any work that is to be performed at the site by Owner or others (such as utilities and other prime contractors) that relates to the work for which a Bid is to be submitted. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such work.
- 4.8. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and applying the specific means, methods, techniques, sequences or procedures of construction (if any) that may be shown or indicated or expressly required by the Contract



Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof by Engineer is acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

- 4.9. The provisions of ITB-4.1 through 4.8, inclusive, do not apply to Asbestos, Polychlorinated biphenyls (PCBs), Petroleum, Hazardous Waste or Radioactive Material covered by Paragraph 4.06 of the General Conditions.

5. Availability of Lands for Work, etc.

- 5.1 The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

6. Interpretations and Addenda

- 6.1. All questions about the meaning or intent of the Bidding Documents are to be directed to Engineer. Every request for such interpretation and all questions must be made in writing and addressed to: Engineering Strategies, Inc., Attention: Pedro Rossello, P.E., 3855 Shallowford Rd., Suite 525, Marietta, GA 30062. In lieu of mail, questions may be made by e-mail to prossello@esi-ga.com. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addendum mailed or delivered to all parties recorded by Issuing Office as having received the Bidding Documents. Questions received less than five days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 6.2. Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer.
- 6.3. Failure of any Bidder to receive any such addendum or interpretations shall not relieve such bidder from any obligation under his Bid as submitted.
- 6.4. Failure of any Bidder to acknowledge any such addendum or interpretations shall not relieve such Bidder from any obligation under his Bid as submitted, if Bidder has knowledge of any such addendum, or interpretations. If Bidder has knowledge of any such addendum or interpretation but fails to acknowledge, this will be considered an informality.

7. Bid Security

- 7.1. Each Bid must be accompanied by a Bid Bond (on the form attached) with good and sufficient surety or sureties approved by the Owner and meeting the requirements of Paragraph 5.01 of the General Conditions, for faithful acceptance of the contract, payable to, in favor of, and for the protection of the Owner in an amount equivalent to five percent (5%) of the total amount payable by the terms of the contract, in lieu thereof, in the form of a certified check, cashier's check, or cash in equal amount. Bidders who submit Bid Security



in the form of a certified check, cashier's check, or cash are bound by the "Terms of Bid Bond" as if submitted on the attached "Bid Bond "form.

7.2. The Bid Security of the Successful Bidder will be retained until such Bidder has executed the Agreement, furnished the required contract security and Certifications of Insurance and met the other conditions of the Notice of Award, whereupon the Bid Security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within fifteen days after the Notice of Award, Owner may annul the Notice of Award and Bid Security of that Bidder will be forfeited. The Bid Security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement or the sixtieth day after the Bid opening whereupon Bid Security furnished by such Bidders will be returned. Bid Security with Bids which are not competitive will be returned within seven days after the Bid opening, if requested by the respective Bidder. The name of the company on the Certification of Insurance must match current registration with the Secretary of State.

7.3. Failure of Bidder to provide qualification information, if requested, within 10 days of notification of request, shall be grounds for forfeiting of the Bid Security of that Bidder.

8. Contract Times

8.1. The number of days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the term "Contract Times" is defined in paragraph 1.01. A.14. of the General Conditions) are set forth in the Agreement and incorporated therein by reference in the attached Bid Form.

9. Liquidated Damages

9.1. Provisions for liquidated damages are set forth in the Agreement.

10. Substitute and "Or Equal" Items

10.1. The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items which have not received approval of the Engineer. The procedure and timing for submission of any substitution by Contractor and consideration by Engineer is set forth in Paragraph 6.05 of the General Conditions.

11. Subcontractors, Suppliers and Others

11.1. The Contractor shall perform a minimum of 50 percent of the onsite labor with its own employees. If the General Conditions or Supplementary Conditions require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening (or other date as may be specified by General Conditions or Supplementary Conditions) submit to Owner a list of all such Subcontractors, Suppliers and other persons and organizations proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such



Subcontractor, Supplier, person or organization if requested by Owner. Owner or Engineer who after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person or organization, may before the Notice of Award is given request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, provided that Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution and Owner may consider such price adjustment in evaluating Bids and making the contract award.

- 11.2. If apparent Successful Bidder declines to make any such substitution, Owner may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Bidder. Any Subcontractor, Supplier, other person or organization submitted to Owner and Engineer by Bidder and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06B of the General Conditions.

12. Bid Form

- 12.1. The Bid Form is included with the Bidding Documents.
- 12.2. All blanks on the Bid Form must be completed by printing in ink or by typewriter.
- 12.3. Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature and the signature shall be in blue ink. The name of the bidder must match the current registration with the Secretary of State. Bids submitted with a bidder's name shown as "Doing Business As" without an official corporation name currently registered with the Secretary of State shall not be accepted.
- 12.4. Bids by partnerships and Limited Liability Companies (LLCs) must be executed in the partnership or LLC name and signed in blue ink by a partner, whose title must appear under the signature and the official address of the partnership or LLC must be shown below the signature. The name of the bidder must match the current registration with the Secretary of State. A seal is not required for partnerships or LLCs. Bids submitted with a bidder's name shown as "Doing Business As" without an official partnership or LLC name currently registered with the Secretary of State shall not be accepted.
- 12.5. All names must be typed or printed in ink below the signature.
- 12.6. The Bid shall contain an acknowledgement of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).
- 12.7. The address and telephone number for communications regarding the Bid must be shown.
- 12.8. Evidence of authority to conduct business as an out-of-state corporation in the state where the Work is to be performed shall be provided with the Bid Form.



- 12.9. Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the bid is submitted. Any bid which is not properly prepared and accompanied by required certifications may be rejected by the Owner.

13. Submission of Bids

- 13.1. Bids shall be submitted at the time and place indicated in the Advertisement or Invitation to Bid and shall be enclosed in an opaque sealed envelope, marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted) and name and address of Bidder, and accompanied by the Bid security, Contractor's License Certification, Non-collusion Affidavit of Bidder, Bid Form, Corporate Certificate, and other required documents for a complete, responsive and responsible bid. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

14. Modification of Bids

- 14.1. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the closing time.

15. Opening of Bids

- 15.1. Bids will be opened at the place where Bids are to be submitted. An abstract of the amounts of the base Bids and major alternates (if any) will be made available to Bidders after the effective date of the Contract.
- 15.2. The Owner is not obligated to consider a Bidder's proposal, if Bidder is not on record with the Issuing Office as having attended the Pre-Bid Conference and received complete Bidding Documents from the Issuing Office.
- 15.3. No bid shall be considered unless a proper bid bond or other security authorized in Paragraph 7 of these Instructions to Bidders is submitted.

16. Bids to Remain Subject to Acceptance

- 16.1. All Bids will remain subject to acceptance for sixty days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date. Owner shall release any Bid and return the Bid Security if a Bidder requests the withdrawal of its Bid and basis of withdrawal is in accordance with O.C.G.A. § 36-91-52.

17. Award of Contract

- 17.1. Owner reserves the right to reject all Bids, including without limitation the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. Owner also reserves the right to waive all informalities not



involving price, time or changes in the Work and to negotiate contract terms with the Successful Bidder. In the event a Bid is rejected by Owner or a Bidder is permitted by Owner to withdraw its Bid, Owner reserves the right to preclude such Bidder from resubmitting a Bid at any subsequent re-bidding of the Work. 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. Discrepancies between words and figures will be resolved in favor of the words.

- 17.2. In evaluating Bids, Owner will consider the qualifications of Bidders, whether or not the Bids comply with the prescribed requirements as indicated in the Advertisement for Bid, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award. Conditional Bids will not be accepted.
- 17.3. Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. Owner also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.
- 17.4. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- 17.5. If the contract is to be awarded, it will be awarded to the responsible and responsive Bidder submitting the lowest Bid whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Project.
- 17.6. If the contract is to be awarded, Owner will give Successful Bidder a Notice of Award within sixty days after the day of the Bid opening.

18. Contract Security

- 18.1. Paragraph 5.01 of the General Conditions and the Supplementary Conditions set forth Owner's requirements as to Performance and Payment Bonds. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by the required Performance and Payment Bonds in the form as shown on Exhibits B and C of the Contract Documents.

19. Signing of Agreement

- 19.1. When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within fifteen days thereafter Contractor shall sign and deliver the required number of counterparts of the Agreement, Contractor Affidavit and Agreement, Subcontractor Affidavit(s) and Agreement(s), and attached documents to Owner with the required Bonds and Certification of Insurance. Within fifteen days of the Owner's receipt

from the Contractor of the following documents in proper form: the required number of executed counterparts of the Agreement, the Bonds, the oath pursuant to O.C.G.A. § 36-91-21(e), the Certification of Insurance, and any other documents required by the Bidding Requirements, Owner shall deliver one fully signed counterpart to the Contractor. Each counterpart is to be accompanied by a complete set of the Drawings with appropriate identification. The name of the company on the Certification of Insurance must match current registration with the Secretary of State.

20. Laws and Regulations

- 20.1. All applicable federal and state laws, municipal ordinances, and rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

21. Security and Immigration Act

- 21.1 Contractors and Subcontractors who enter into contracts with public employers are required to register and participate in the Federal Work Authorization Program to verify work eligibility information of new employees. Bidders are required to fill out the following forms located in the Bidding Documents attesting to their status under this program and that they will pass on the same requirements to their Subcontractors as required by OCGA 13-10-90 and 13-10-91; GA Department of Labor 300-10-1:

21.1.1 Affidavit Verifying Status for Cobb County-Marietta Water Authority;

21.1.2 Security and Immigration Compliance Act Certification.

- 21.2 Pursuant to Code of Georgia 13-10-90 et. seq., the Georgia Security and Immigration Compliance Act of 2006, the following forms located in the Bidding Documents shall be completed prior to Award:

21.2.1 Contractor Affidavit and Agreement;

21.2.2 Subcontractor and Sub-subcontractor Affidavit and Agreement.

- 21.3 Contractor understands and agrees that compliance with the requirements of OCGA 13-10-90, OCGA 13-10-91, and Georgia Department of Labor Rule 300-10-1 are conditions of this Agreement.

- 21.4 Contractor further agrees that such compliance shall be attested by Contractor and its Subcontractors and Sub-subcontractors by execution of the appropriate Contractor Affidavit and Agreement and Subcontractor Affidavit forms included in the Contract Documents.

22. Pre-Bid Conference

- 22.1 A mandatory Pre-Bid Conference will be held for all Bidders outside the Granular Activated Carbon (GAC) Building near the Wash Water Tank Site at the Hugh A. Wyckoff WTP, 3728



Mars Hill Road, Acworth, GA 30101 on Wednesday, June 17, 2020, at 10:30 AM.
Attendance is mandatory for all bidders.

- 22.2 All bidders submitting a bid must attend the mandatory pre-bid meeting. Failure to attend the mandatory pre-bid meeting shall result in disqualification of the bidder's bid. No one individual is permitted to represent more than one bidder at the pre-bid meeting. Any individual that does attempt to represent two or more bidders will be required to select one bidder to which the individual's attendance will be attributed. The bidders not selected will be deemed to have not attended the pre-bid meeting unless another individual attended on their behalf. The required attribution of attendance to a single bidder should be addressed during the pre-bid meeting but may occur at any time deemed appropriate by Owner.
- 22.3 An attendance sheet provided at the pre-bid meeting shall serve as the official document verifying attendance. Any person attending the pre-bid meeting on behalf of a bidder must list on the attendance sheet his or her name and the name of the bidder he or she is representing.
- 22.4 Additionally, the person attending the pre-bid meeting should include the bidder's e-mail address and phone number on the attendance sheet. It is the bidder's responsibility to locate the attendance sheet and provide the required information. Failure to complete the attendance sheet as required shall result in disqualification of bidder's bid.
- 22.5 All bidders should arrive prior to the starting time for the pre-bid meeting. Bidders who arrive after the starting time but prior to the end of the pre-bid meeting will be permitted to sign in but are charged with knowing all matters discussed during the entirety of the pre-bid meeting.

- END OF SECTION -



SECTION 00 31 46
PERMITS AND EASEMENTS

1 GENERAL

1.1 GENERAL

The following table contains information about the status of the permits and easements that are to be obtained by the Owner for this project.

Item No.	Permit or Easement	Status	Expected Approval or Acquisition Date
1	Cobb County Community Development	Application submitted in March 2020. Final approval will not be given until Contractor's submittal of Stormwater Notice of Intent (NOI).	Approval expected in May 2020. Upon contract award and Contractor submittal of NOI to Georgia EPD and Cobb County Community Development.
2	Georgia Environmental Protection Division (EPD)	Plans and specifications to be submitted with engineering report in May 2020.	Approval expected in July 2020.

- END OF SECTION -



BID FORM

PROJECT IDENTIFICATION:

BIDDER: _____

Cobb County-Marietta Water Authority
WYCKOFF WTP CLEARWELL #3

THIS BID IS SUBMITTED TO:

Cobb County-Marietta Water Authority
1170 Atlanta Industrial Dr.
Marietta, Georgia 30066

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Advertisement for Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for sixty days after the day of Bid opening. Bidder will sign and deliver the required number of counterparts of the Agreement with the Bonds, Certifications of Insurance, and other documents required by the Bidding Requirements within fifteen days after the date of Owner's Notice of Award.

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

(a) Bidder has examined and carefully studied the Bidding Documents and the following Addenda receipt of all of which is hereby acknowledged: (List Addenda by Addendum Number and Date)

(b) Bidder has visited the site and is familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance and furnishing of the Work, and bidder has not relied upon any oral representations by employees or agents of Owner or Engineer.

(c) Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

(d) Bidder has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site which have been identified in the Supplementary Conditions as provided in paragraph 4.02.A of the General Conditions. Bidder accepts the determination, if any, set forth in paragraph SC-4.02. A of the Supplementary Conditions of the extent of the "technical data" contained in such reports and drawings upon which Bidder is entitled to rely as provided in paragraph 4.02 of the General Conditions. Bidder acknowledges that such reports and drawings are not Contract Documents and may not be complete for Bidder's purposes. Bidder acknowledges that

Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto. Bidder does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price and other terms and conditions of the Contract Documents.

- (e) Bidder is aware of the general nature of Work to be performed by Owner and others at the site that relates to Work for which this Bid is submitted as indicated in the Contract Documents.
 - (f) Bidder has correlated the information known to Bidder, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.
 - (g) Bidder has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Bidder has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Bidder, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.
 - (h) This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.
4. Instructions for bid form: For each Bid item, Bidders shall enter a price for each single unit, then multiply by the estimated quantity shown and enter the total amount in the space indicated in numerals. Bidder acknowledges that estimated quantities are not guaranteed, and final payment will be based on actual quantities determined in accordance with the Contract Documents. The Project will be awarded in one contract on the basis of the lowest Total Base Bid or lowest Alternate Bid if requested in the Bid Form, as determined by Owner to be in Owner's best interest.
5. As defined in Division 01, General Requirements, Bidder shall complete the Work in accordance with the Contract Documents for the following bid prices:

BID FORM
Cobb County-Marietta Water Authority, Georgia
Wyckoff WTP Clearwell #3

BID
ITEM
NO.

ITEM DESCRIPTION

PRICE

- 1 LUMP SUM WORK** - Furnishing all materials, labor, services and incidentals necessary to complete the construction of Wyckoff WTP Clearwell #3, as shown or specified in the contract documents, **excluding** cash allowances and unit price items, in the amount of:

Dollars

Words

ITEM 1, LUMP SUM WORK

\$

Numerals

2 ALLOWANCES (Refer to Section 01 21 00)

2.1	Allowance for Owner-Directed Work	\$	500,000.00
2.2	Cash Allowance for Testing and Special Inspections (other than provided by Engineer)	\$	250,000.00
2.3	Cash Allowance for Construction Surveying for Engineer's Use Only	\$	15,000.00
2.4	Cash Allowance for Additional Electronic Equipment for Engineer's Trailer Not Listed in Specifications	\$	15,000.00
2.5	Cash Allowance for Landscaping (other than Grassing included in Base Bid Price)	\$	50,000.00
2.6	Cash Allowance for Owner's/Engineer's Travel Expenses to Attend Butterfly Valve and Steel Pipe Witness Tests	\$	10,000.00

ITEM 2, TOTAL ALLOWANCES

\$ 840,000.00

Numerals

3 UNIT PRICE ITEMS

Item No.	Description	Quantity	Unit	Unit Price	Extended Price
3.1	Locator marker ball (per Detail 110-B including 3M 1423-XR/iD ball marker for water or electric, PVC pipe, gravel and installation)	100	EA		
3.2	Locator Marker Instrument (3M Dynatel Pipe/Cable/iD Locator 2550-iD/U12 with one carrying bag and rechargeable battery)	1	EA		

ITEM 3, TOTAL EXTENDED UNIT PRICES

\$

Numerals

BID FORM
Cobb County-Marietta Water Authority, Georgia
Wyckoff WTP Clearwell #3

TOTAL BASE BID PRICE (Sum of Items 1, 2 and 3)

	Dollars
Words	
	\$
Numerals	

ALTERNATES

A Deductive Alternate for Precast Concrete Roof:

The following amount shall be deducted from Total Base Bid Price. (Do not enter a negative number, enter zero if Precast Concrete Roof would result in an increase to the Total Base Bid Price.)

Amount to be deducted from Total Base Bid Price

	\$
Numerals	



6. Major Equipment/Material Schedule: The Total Base Bid Price in Part 1 shall include the costs for the circled Manufacturers listed in the following Major Equipment/Material Schedule. This Schedule lists the base bid equipment/material manufacturer as applicable for major items for the Wyckoff WTP Clearwell #3 project. The Bidder must indicate which named manufacturer of major equipment/material it intends to provide by circling one of the manufacturers listed. Listed equipment suppliers must meet the terms and conditions and technical requirements of the Contract.

If Bidder does not circle one of the equipment manufacturers for each piece of major equipment, the Owner reserves the right either to determine the Bidder non-responsive and reject the Bid or to designate the Manufacturer of the product(s) to be provided. No adjustments will be made to Total Base Bid if Owner is required to make selection.

Major Equipment/Material Schedule		
<i>Specification Section Number</i>	<i>Equipment/Material Description</i>	<i>Manufacturer</i>
33 05 24	Steel Pipe	American Spiralweld Northwest Pipe Company Thompson Pipe Group
40 27 02	Butterfly Valves	DeZurik Pratt Val-Matic

7. Subcontractor Schedule: Identify the subcontractors which will be used for the following trades (if the Bidder intends to self-perform a given trade, the Bidder's name should be listed in the space for Subcontractor for that trade):

Trade	Subcontractor
Earthwork	
Rock Anchoring	
Cast-in-Place Concrete	
84" Steel Piping	
Electrical*	
I&C System Integrator*	

* Refer to Section 00 20 00, Approved Suppliers of Services.

8. Bidder agrees that the Work will be **substantially complete** within **540 consecutive calendar days** after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within **570 consecutive calendar days** after the date when the Contract Times commence to run.

Bidder accepts the provisions of the Agreement as to **Liquidated Damages** in the event of failure to complete the Work within the time(s) specified in the Agreement.

9. The following documents are attached to this Bid Form and are made a condition of this Bid:
- (a) **Bid Bond.** The required bid security in the form of bid bond, certified check, cashier's check or cash must be included and attached to the Bid Bond form. Bidders who submit Bid Security in the form of a certified check, cashier's check or cash are bound by the "Terms of Bid Bond".
 - (b) **Corporate Certificate.**
 - (c) **Contractor's License Certification.**
 - (d) **Statement of Bidder's Qualifications (including Project Information Forms).**
 - (e) **Non-Collusion Affidavit of Bidder.**
 - (f) **Affidavit Verifying Status for Cobb County-Marietta Water Authority Public Benefit Application.**
 - (g) **Security and Immigration Act Compliance Certification.**
 - (h) **Security and Immigration Act Compliance Certification of all Sub-Contractors and all Sub-Sub-Contractors** (these forms may be submitted by the successful Bidder after Notice of Award is issued but shall be provided prior to Sub-Contractor or Sub-Sub-Contractor performing any Work on the Project and made part of this Bid by reference).
10. Communications concerning this Bid shall be addressed to:

The address of Bidder indicated below.

BIDDER'S NAME _____

Primary Contact Person _____

Secondary Contact Person _____

Bidder's Street Address _____

Bidder's Phone # _____

Bidder's Fax # _____ (optional)

11. Terms used in this Bid which are defined in the General Conditions or Instructions will have the meanings indicated in the General Conditions or Instructions.

THIS BID SUBMITTED on _____, 20__.

If BIDDER is:

An Individual

By _____ (SEAL)

(Individual Name)

doing business as: _____

Business Address: _____

Phone No.: _____

A Partnership

By _____ (SEAL)

(Firm Name)

(General Partner Name and Signature)

Business Address: _____

Phone No.: _____

A Corporation

By _____ (SEAL)

(Corporation Name)

(State of Incorporation)

By _____
(Signature of person authorized to sign)

By _____
(Name of person authorized to sign)

(Title)

(Corporate Seal)

Attest _____

Business address: _____

Phone No.: _____

Date of Qualification to do business is _____



STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information desired. Attach all additional sheets to this statement. The Bidder must include this SBQ form, completely filled out with the requested information, and any accompanying information with the Bid.

1. Name of Bidder: _____
2. Bidder's permanent, main office address and phone number: _____
3. When organized: _____
4. If a Corporation, where incorporated: _____
5. How many years has Bidder been engaged in the contracting business under present firm or trade firm or trade name? _____
6. General description of type of work performed by your company: _____
7. Have you ever failed to complete any work awarded to you? If so, where and why? _____
8. Have you ever defaulted on a contract? If so, where and why? _____
9. Complete a "Project Information Form" for projects that match the requirements specified in the Advertisement for Bid (AFB). (Minimum of two, maximum of six)
10. Document experience in construction work similar in nature to this Project.
11. Background and experience of the principal members of your organization, including officers.
12. Background and experience of the Project Manager that will be assigned to this Project.
13. Background and experience of the Superintendent that will be assigned to this Project.
14. Name of supervisory personnel certified Level 1A – Fundamentals of the Georgia Erosion and Sediment Control training program.

- 15. Any history of litigation, arbitration, or other related mediation actions for the proposed Project superintendent or referenced Projects?
- 16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Owner?
- 17. The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement of Bidder's Qualifications.

I, _____, certify that I am _____ of the
(name) (title)
Bidding Firm, and that the answers to the foregoing questions and statements contained therein are true and correct.

BIDDER: _____

By: _____
(Signature)

Title: _____

Date: _____

Subscribed and sworn to me this _____ day of _____, 20__.

NOTARY PUBLIC: _____
(Signature)

Commission Expires: _____
(Date)

(SEAL)

Project Information Form

Project Title: _____

Project Description: _____

Project Owner:

Owner Name: _____

Contact Person: _____

Phone Number: _____

Engineer/Construction Manager:

Company Name: _____

Contact Person: _____

Phone Number: _____

Contract Amount:

Initial: _____

Final: _____

Contract Time:

Initial: _____

Final: _____

Completion Date: _____

Project Information Form

Project Title: _____

Project Description: _____

Project Owner:

Owner Name: _____

Contact Person: _____

Phone Number: _____

Engineer/Construction Manager:

Company Name: _____

Contact Person: _____

Phone Number: _____

Contract Amount:

Initial: _____

Final: _____

Contract Time:

Initial: _____

Final: _____

Completion Date: _____

Project Information Form

Project Title: _____

Project Description: _____

Project Owner:

Owner Name: _____

Contact Person: _____

Phone Number: _____

Engineer/Construction Manager:

Company Name: _____

Contact Person: _____

Phone Number: _____

Contract Amount:

Initial: _____

Final: _____

Contract Time:

Initial: _____

Final: _____

Completion Date: _____

END OF SECTION



BID BOND

PENAL SUM FORM

BIDDER *(Name and Address):*

SURETY *Name and Address of Principal Place of Business):*

OWNER:

Cobb County-Marietta Water Authority
1170 Atlanta Industrial Dr.
Marietta, Georgia 30066

BID

BID DUE DATE: July 1, 2020, 11:00 AM

PROJECT:

WYCKOFF WTP CLEARWELL #3

Construction of new 6 million gallons cast-in-place concrete clearwell, 84-inch yard piping and appurtenances.

BOND

BOND NUMBER _____

DATE: *(Not later than Bid Due Date):* _____

PENAL SUM: **5 PERCENT OF BASE BID**

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the following terms hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

TERMS OF BID BOND

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.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents the executed Agreement required by the Bidding Documents, any performance and payment bonds, and Certification of Insurance required by the Bidding Documents and Contract Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents, any performance and payment bonds and Certification of Insurance required by the Bidding Documents and Contract 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 time for issuing notice of award including extensions shall not in the aggregate exceed 60 days from the Bid Due Date without Surety's written consent.

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

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

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

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

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

Witness as to Principal:

Principal

(signature)

By: _____(SEAL)
(signature)

Title: _____

Witness as to Surety:

Surety

(signature)

By: _____
Attorney-in-Fact (signature)

Address of Attorney-in-Fact

- END OF SECTION -

Non-Collusion Affidavit of Bidder

STATE OF GEORGIA

COUNTY OF COBB

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

He or she is _____ of
(Owner, Partner, Officer, Representative or Agent)

_____, the Bidder that has submitted the attached Bid;

He or she is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

Such Bid is genuine and is not a collusive or sham Bid;

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 Cobb County-Marietta Water Authority or any person interested in the proposed Contract; and

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 before me this _____ day of _____, 20__.

(Notary Public) *(signature)*
(SEAL)

My Commission Expires: _____

END OF SECTION

Corporate Certificate

I, _____, certify that I am the Secretary of the Corporation named as Bidder in the foregoing Bid; that _____, who signed said Bid on behalf of the Contractor was then _____ of said Corporation; that said Bid was duly signed for and on behalf of said Corporation by authority of its Board of Directors, and is within the scope of its corporate powers; that said Corporation is organized under the laws of the State of _____.

This ____ day of _____, 20__.

Corporate Secretary:

(name signed)

(name printed or typed)

(SEAL)

END OF SECTION

Contractor's License Certification

Bidder/Contractor's Name: _____

Georgia Utility Contractor's License Number: _____

Expiration Date of License: _____

I certify that the above information is true and correct and that the classification noted is applicable to the Bid for this Project.

BIDDER: _____

By: _____
(name signed)

(name printed or typed)

Title: _____

Date: _____

END OF SECTION

***Affidavit Verifying Status
For Cobb County-Marietta Water Authority
Public Benefit Application***

By executing this affidavit under oath, as an applicant for a Cobb County-Marietta Water Authority contract or other public benefit as referenced in O.C.G.A. § 50-36-1, I am stating the following with respect to my application for a Cobb County-Marietta Water Authority contract or other public benefit:

1) _____ I am a United States citizen

OR

2) _____ I am a legal permanent resident 18 years of age or older or I am an otherwise qualified alien or non-immigrant under the Federal Immigration and Nationality Act 18 years of age or older and lawfully present in the United States.*

In making the above representation under oath, I understand that any person who knowingly and willfully makes a false, fictitious, or fraudulent statement or representation in an affidavit shall be guilty of a violation of Code Section 16-10-20 of the Official Code of Georgia.

Signature of Applicant:

Date:

Printed Name:

*

Alien Registration Number for non-citizens

SUBSCRIBED AND SWORN BEFORE
ME ON THIS THE _____ DAY OF
_____, 20____

Notary Public
My Commission Expires:

*Note: O.C.G.A. § 50-36-1(e)(2) requires that aliens under the federal Immigration and Nationality Act, Title 8 U.S.C., as amended, provide their alien registration number. Because legal permanent residents are included in the federal definition of "alien", legal permanent residents must also provide their alien registration number. Qualified aliens that do not have an alien registration number may supply another identifying number below:

SECURITY AND IMMIGRATION COMPLIANCE ACT CERTIFICATION

Pursuant to the Georgia Security and Immigration Compliance Act of 2006, Contractor understands and agrees that compliance with the requirements of OCGA 13-10-91 and Georgia Department of Labor Rule 300-10-1 et. seq. are conditions of Agreement. Contractor further agrees that such compliance shall be attested through execution of Contractor Affidavit and Agreement required by Georgia Department of Labor Rule 300-10-1-.07, or a substantially similar contractor affidavit. Contractor's fully executed affidavit is attached and is incorporated into this Agreement by reference herein.

By initialing in the appropriate line below, Contractor certifies that the following employee number category as identified in OCGA 13-10-91 is applicable to Contractor:

- 1. _____ 500 or more employees;
- 2. _____ 100 or more employees;
- 3. _____ Fewer than 100 employees.

Contractor understands and agrees that, in the event Contractor employs or contracts with Subcontractor in connection with this Agreement, Contractor shall:

- 1. Secure from each Subcontractor an indication of the employee-number category as identified in OCGA 13-10-91; and
- 2. Secure from each Subcontractor an attestation of Subcontractor's compliance with OCGA 13-10-91 and Georgia Department of Labor Rule 300-10-1-.02 by causing each Subcontractor to execute the attached Subcontractor Affidavit required by Georgia Department of Labor Rule 300-10-1-.08, or a substantially similar subcontractor affidavit. Contractor further understands and agrees that Contractor shall require the executed Subcontractor Affidavit to become a part of the agreement between Contractor and each Subcontractor. Contractor agrees to maintain records of each Subcontractor attestation required hereunder for inspection by Owner.

BY: Authorized Officer or Agent

Date

Title of Authorized Officer or Agent if Contractor

Printed Name of Authorized Officer or Agent

Subscribed and Sworn Before Me on this
_____ day of _____, 20____

Notary Public
My Commission Expires:

Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of THE COBB COUNTY-MARIETTA WATER AUTHORITY has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Contractor

WYCKOFF WTP CLEARWELL #3

Name of Project

Cobb County-Marietta Water Authority

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ____, 20__ in _____ (city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____, 20__.

NOTARY PUBLIC

My Commission Expires: _____

Subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(3)

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract with _____ on behalf of THE COBB COUNTY-MARIETTA WATER AUTHORITY has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the subcontractor with the information required by O.C.G.A. § 13-10-91(b). Additionally, the undersigned subcontractor will forward notice of the receipt of an affidavit from a sub-subcontractor to the contractor within five business days of receipt. If the undersigned subcontractor receives notice of receipt of an affidavit from any sub-subcontractor that has contracted with a sub-subcontractor to forward, within five business days of receipt, a copy of such notice to the contractor. Subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Subcontractor

WYCKOFF WTP CLEARWELL #3
Name of Project

Cobb County-Marietta Water Authority
Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ____, 20__ in _____ (city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF _____, 20__.

NOTARY PUBLIC

My Commission Expires: _____

Sub-subcontractor Affidavit under O.C.G.A. § 13-10-91(b)(4)

By executing this affidavit, the undersigned sub-subcontractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services under a contract for _____ (insert name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract) and _____ (insert name of contractor) on behalf of THE COBB COUNTY-MARIETTA WATER AUTHORITY has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned sub-subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned sub-subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the sub-subcontractor with the information required by O.C.G.A. § 13-10-91(b). The undersigned sub-subcontractor shall submit, at the time of such contract, this affidavit to _____ (insert name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Additionally, the undersigned sub-subcontractor will forward notice of the receipt of any affidavit from a sub-subcontractor to _____ (insert name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Sub-subcontractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

Federal Work Authorization User Identification Number

Date of Authorization

Name of Sub-subcontractor

WYCKOFF WTP CLEARWELL #3

Name of Project

Cobb County-Marietta Water Authority

Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, ____, 20__ in _____ (city), _____ (state).

Signature of Authorized Officer or Agent

Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE _____ DAY OF _____, 20__.

NOTARY PUBLIC

My Commission Expires: _____

NOTICE OF AWARD

Dated: _____

TO BIDDER: _____

ADDRESS: _____

PROJECT OR CONTRACT NAME: WYCKOFF WTP CLEARWELL #3
(Insert name of Project (Contract) as it appears in the Agreement)

OWNER's Contract No. 505-9005-33-19-0000

You are notified that your Bid dated _____ for the above Project has been considered. You are the apparent Successful Bidder and have been awarded a Contract for:

WYCKOFF WTP CLEARWELL #3

(Indicate total Work, alternates or sections of Work awarded)

The Contract Price of this Contract is _____ Dollars.

(\$ _____ Dollars).

Six (6) copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. Six sets of the Drawings will be delivered separately or otherwise made available to you immediately.

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

1. Deliver to the Owner six (6) fully executed counterparts of the Contract Documents. Each of the Contract Documents must bear your signature on the Agreement, Payment Bond, Performance Bond, Pre-Construction Oath, Certification of Contractor's Attorney, Contractor Affidavit and Agreement, and required Subcontractor Affidavit and Agreements.
2. Deliver with the executed Contract Documents the Contract security (Bonds) as specified in the Instructions to Bidders and General Conditions (paragraph 5.01).
3. Execute the Performance and Payment Bonds, but DO NOT DATE. Cobb County-Marietta Water Authority will date the bonds with the same date as the Agreement.
4. Deliver with the executed Contract Documents evidence of all insurance which Contractor is required to provide under the Contract Documents.

5. Deliver with the executed Contract Documents the Insurance Certificate Checklist filled out by Contractor's insurance agent.
6. (List other conditions.)

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

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

COBB COUNTY-MARIETTA WATER AUTHORITY

By: _____
(AUTHORIZED SIGNATURE)

(TITLE)

Copy to ENGINEER

AGREEMENT BETWEEN OWNER AND CONTRACTOR

AGREEMENT made by and between the **Cobb County-Marietta Water Authority** (hereinafter called Owner) and _____ (hereinafter called Contractor).

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

Article 1. WORK.

The Project for which the Work under the Contract Documents may be the whole or only a part is identified with the following Project Name:

**COBB COUNTY-MARIETTA WATER AUTHORITY
WYCKOFF WTP CLEARWELL #3**

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

Construction of new 6 million gallons cast-in-place concrete clearwell, 84-inch yard piping and appurtenances.

Article 2. ENGINEER.

The Project has been designed by Engineering Strategies, Inc. who is hereinafter called Engineer and who is to act as Owner's representative, assume all duties and responsibilities and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

Article 3. CONTRACT TIMES.

3.1 The Work will be substantially completed within **540 consecutive calendar days** after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within **570 consecutive calendar days** after the date when the Contract Times commence to run. Construction sequencing constraints and limitations, if any, are described in Section 01 31 13, Project Coordination (this section is included only if there are sequencing constraints or limitations).

3.2 *Liquidated Damages.* Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. Any delays in completing this work will have significant impacts on the Owner. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner one thousand five hundred dollars (\$1,500) for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial

Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the time specified in paragraph 3.1 for completion and readiness for final payment or any proper extension thereof granted by Owner, Contractor shall pay Owner two hundred fifty dollars (\$250) for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment.

Article 4. CONTRACT PRICE.

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 4.1, 4.2 and 4.3 below:

4.1 For all Work other than Unit Price Work, an amount equal to the sum of the established Lump Sum item(s) of Work as indicated in the Contractor's Bid. All specific cash allowances are included in the appropriate items of work and have been computed in accordance with paragraph 11.02.A of the General Conditions;

plus

4.2 For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work multiplied by the quantity of the item as indicated in CONTRACTOR's Bid;

plus

4.3 For all additional Work authorized by the Owner to be compensated from the Contingency Allowance(s).

**SUM OF ALL LUMP SUM PRICES, ALL UNIT PRICES AND CONTINGENCY ALLOWANCES:
(in words) _____ DOLLARS.**

(Total Contract Price to be written in words)

As provided in paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classification are to be made by ENGINEER as provided in paragraph 9.07 of the General Conditions. Unit prices have been computed as provided in paragraph 11.03.A of the General Conditions.

Article 5. PAYMENT PROCEDURES.

Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

5.1. *Progress Payments*; Retainage. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer, on or about the 25th day of each month during construction as provided in paragraphs 5.1.1 and 5.1.2 below.

5.1.1. All such payments will be measured by values of work completed as provided by the schedule established in paragraph 2.07 of the General Conditions, plus the value of materials and equipment suitably stored, insured, and protected at the construction site, and with the Owner's consent, such

materials and equipment suitably stored, insured, and protected off-site at a location approved by the Engineer, less a retainage of ten percent (10%) of each progress payment requested; provided, however, when fifty percent (50%) of the Contract Price, including change orders and other additions to the Contract, is due and the manner of completion of the contract work and its progress is reasonably satisfactory to the Engineer, in the Engineer's sole discretion, the Owner shall withhold no more retainage on additional work completed.

5.1.2 The Contractor shall be entitled to withhold retainage from subcontractors in accordance with this Agreement and Georgia Law. Provided that the value of each subcontractor's work complete and in place equals fifty percent (50%) of his or her subcontract value, including approved change orders and other additions to the subcontract value, and provided that the work of the subcontractor is proceeding satisfactorily and the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his or her work including any warranty work as the Contractor in its reasonable discretion may require, including but not limited to a payment and performance bond, then the Contractor shall reduce or discontinue each subcontractor's retainage in the same manner as the Contractor's retainage is reduced or discontinued by the Owner. At the discretion of the Owner, upon recommendation of the Engineer and with consent of the Contractor, the retainage of each subcontractor may be released separately as the subcontractor completes his work. If the Contractor does not give such consent, the Contractor shall promptly give the Owner a written explanation of its reason.

5.1.3 If, after discontinuing the retainage, the Engineer determines that the work is unsatisfactory or has fallen behind schedule, retention shall be resumed at the previous level. If retention is resumed, the Contractor shall be entitled to resume withholding retainage from any affected subcontractors.

5.2. *Final Payment.*

5.2.1 At substantial completion of the contract work and as the Engineer determines the work to be reasonably satisfactory, the Owner shall within 60 days after presentation of Application and other appropriate documentation as required by Article 14 of the General Conditions are provided, pay the retainage to the Contractor. If at that time there are any remaining incomplete minor items, an amount equal to 200 percent of the value of each item, as determined by the Engineer, shall be withheld until such item or items are completed. The reduced retainage shall be shared by the Contractor and subcontractors as their interests may appear. The Contractor shall, within ten (10) days from Contractor's receipt of retainage from the Owner, pass through payments to subcontractors and shall reduce each subcontractor's retainage in the same manner as the Contractor's retainage is reduced by the Owner provided that the value of each subcontractor's work complete and in place equals fifty percent (50%) of his subcontract value, including approved change orders and other additions to the subcontract value and provided, further, that the work of the subcontractor is proceeding satisfactorily and the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the Contractor in his reasonable discretion may require, including, but not limited to a payment and performance bond.

- 5.2.2 If pursuant to paragraph 14.04 of the General Conditions Engineer issues a certificate of Substantial Completion for a part of the Work prior to the Substantial Completion of all of the Work, the Owner shall within 45 days after presentation of Application and other appropriate documentation as required by Article 14 of the General Conditions are provided, pay the retainage for such part of the Work to the Contractor. If at that time there are any remaining incomplete minor items for such part of the Work, an amount equal to 200 percent of the value of each item, as determined by the Engineer, shall be withheld until such item or items are completed. The reduced retainage shall be shared by the Contractor and subcontractors as their interests may appear. The Contractor shall, within ten (10) days from Contractor's receipt of retainage from the Owner, pass through payments to subcontractors and shall reduce each subcontractor's retainage for such part of the Work in the same manner as the Contractor's retainage for such part of the Work is reduced by the Owner provided that the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the Contractor in his reasonable discretion may require, including, but not limited to a payment and performance bond.
- 5.2.3 The subcontractor shall, within ten (10) days from the subcontractor's receipt of retainage from the Contractor, pass through payments to the lower tier subcontractors and shall reduce each lower tier subcontractor's retainage in the same manner as the subcontractor's retainage is reduced by the Contractor, provided that the value of each lower tier subcontractor's work complete and in place equals fifty (50%) percent of his subcontract value, including approved change orders and other additions to the subcontract value and provided, further, that the work of the lower tier subcontractor is proceeding satisfactorily and the lower tier subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete his work including any warranty work as the subcontractor in his reasonable discretion may require, including, but not limited to, a payment and performance bond.
- 5.2.4 All prior certificates or estimates upon which payments have been made are approximate only, and subject to correction in the final payment.

5.3 In the event of a conflict, O.C.G.A. Sections 13-10-80 through 13-10-83 shall supercede and control any provisions to the contrary in this Article 5.

5.4. Contractor's Agreements with Subcontractors.

The Contractor hereby covenants and agrees with Owner to obtain written agreements from each subcontractor setting forth payment procedures in accordance with the foregoing provisions of this Section. Nothing contained herein shall preclude the Contractor, prior to making payment to a subcontractor, from requiring the payee to submit satisfactory evidence that all payrolls, material bills, and other indebtedness connected with the work have been paid.

Article 6. INTEREST.

6.1 The Current Market Rate will be the rate of interest stipulated in Article 14.02.E of Section 00 72 00, "Standard General Conditions of The Construction Contract" (General Conditions) of this agreement.

6.2 All moneys not paid by Owner to Contractor when due as provided in Article 14 of the General Conditions shall bear interest at the Current Market Rate.

6.3 On contracts relating to installation, extension, improvement, maintenance or repair of any water or sewer facility, retainage shall be invested at the Current Market Rate and any interest earned on the retained amount shall be paid to the Contractor when the project has been completed within the Contract Times and for the Contract Price specified in the Contract, or in any amendments or change orders approved in accord with the terms of the Contract.

Article 7. CONTRACTOR'S REPRESENTATIONS.

In order to induce Owner to enter into this Agreement Contractor makes the following representations:

7.1. Contractor has examined and carefully studied the Contract Documents (including the Addenda listed in paragraph 8) and the other related data identified in the Bidding Documents including "technical data."

7.2. Contractor has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work.

7.3. Contractor is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

7.4. 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.

7.5. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.

7.6. Contractor has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Contractor, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

Article 8. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire agreement between Owner and Contractor concerning the Work consist of the following:

8.1 This Agreement (pages 1 to 8, inclusive).

- 8.2 Advertisement for Bid
- 8.3 Instructions to Bidders
- 8.4 Permits and Easements
- 8.5 Bid Form
- 8.6 Bid Bond
- 8.7 Statement of Bidder's Qualifications (where applicable)
- 8.8 Non-Collusion Affidavit of Bidder
- 8.9 Security and Immigration Compliance Act Certification
- 8.10 Affidavit Verifying Status for Cobb County-Marietta Water Authority Public Benefit Application
- 8.11 Corporate Certificate
- 8.12 Contractor's License Certification
- 8.13 Performance Bond
- 8.14 Payment Bond
- 8.15 Certification of Owner's Attorney
- 8.16 Pre-Construction Oath
- 8.17 General Conditions
- 8.18 Supplementary Conditions
- 8.19 Insurance Certificate Checklist
- 8.20 Certification of Contractor's Attorney
- 8.21 Contract Completion Affidavit
- 8.22 Contractor Affidavit and Agreement
- 8.23 Subcontractor Affidavit and Agreement
- 8.24 Notice of Award

- 8.25 Notice to Proceed
- 8.26 Specifications bearing the name WYCKOFF WTP CLEARWELL #3, as listed in table of contents thereof, bound separate from this Agreement.
- 8.27 Addenda number(s) __to __, incorporated herein,
- 8.28 The following which may be delivered or issued after the Effective Date of the Agreement and are not attached hereto: All Written Amendments and other documents amending, modifying or supplementing the Contract Documents pursuant to paragraphs 3.04.A and 3.04.B of the General Conditions.

The documents listed in paragraphs 8.2 et seq. above are attached to this Agreement (except as expressly noted otherwise above).

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified or supplemented as provided in paragraphs 3.04.A and 3.04.B of the General Conditions.

Article 9. MISCELLANEOUS.

9.1. Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.

9.2. No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

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

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

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in triplicate. One counterpart each has been delivered to Owner, Contractor and Engineer. All portions of the Contract Documents have been signed, initialed or identified by Owner and Contractor or identified by ENGINEER on their behalf.

This Agreement will be effective on _____, 20____ (which is the Effective Date of the Agreement).

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement under seal as of the day and year first above-written.

OWNER:
Cobb County-Marietta Water Authority

By: _____
(for Cobb County – Marietta Water Authority)

Title: _____ [SEAL]

Attest:

Assistant Secretary

Witness

Address for giving notices:

Cobb County-Marietta Water Authority
1170 Atlanta Industrial Drive
Marietta, Georgia 30066

CONTRACTOR:

By: _____

Title: _____ [SEAL]

Attest:

Secretary

Witness

Address for giving notices:

(Attach evidence of authority to sign and resolution or other documents authorizing execution of Agreement.)

PRE-CONSTRUCTION OATH

PROJECT NAME: WYCKOFF WTP CLEARWELL #3

CCMWA PROJECT NUMBER: 505-9005-33-19-0000

DATE: _____

STATE OF GEORGIA COUNTY OF COBB

In accordance with O.C.G.A. 36-91-21(e), each of the undersigned persons affiliated with

(Contractor)

being first duly sworn, deposes and says that:

I have not directly violated O.C.G.A. 36-91-21(d), and more specifically, I have not

- prevented or attempted to prevent competition in such bidding or proposals by any means whatever,
- prevented or endeavored to prevent anyone from making a bid or proposal thereof by any means whatever, nor
- caused or induced another to withdraw a bid or proposal for the work.

Each undersigned, to the best of his/her knowledge, affirms that no other officers, agents or other persons acted for or represented the Contractor in the bidding for and procurement of this Contract.

Signature	Printed Name	Title	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Subscribed and Sworn to before me this _____ day of _____, 20____.

_____ My Commission Expires: _____

(Notary Public)

(SEAL)

NOTICE TO PROCEED

Dated: _____

TO CONTRACTOR: _____
ADDRESS: _____

PROJECT OR CONTRACT NAME:
WYCKOFF WTP CLEARWELL #3

OWNER's Contract No. 505-9005-33-19-0000

You are hereby notified that the Contract Times under the above contract will commence to run _____ . By that date you are to begin performing the Work and your obligations under the Contract Documents. In accordance with Article 3 of the Agreement, the date of Substantial Completion is _____ and the date of readiness for final payment is _____ .

Before you may start any Work at the Site, paragraph 2.01 of the General Conditions provides that you and OWNER must each deliver to the other (with copies to ENGINEER and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:
(add other requirements)

COBB COUNTY-MARIETTA WATER AUTHORITY

By: _____
(AUTHORIZED SIGNATURE)

(TITLE)

Copy to ENGINEER

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS _____
(hereinafter called the "Principal") and _____
(hereinafter called the "Surety"), are held and firmly bound unto Cobb County-Marietta Water Authority (hereinafter called the "Owner") and its successors and assigns, in the penal sum of DOLLARS (\$_____), lawful money of the United States of America, for the payment of which the Principal and the Surety bind themselves, their administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered, or is about to enter, into a certain written contract with the Owner, dated _____, which is incorporated herein by reference in its entirety (hereinafter called the "Construction Contract"), for the WYCKOFF WTP CLEARWELL #3, more particularly described in the Construction Contract (hereinafter called the "Project"); and

NOW, THEREFORE, the conditions of this obligation are as follows, that if the Principal shall fully and completely perform all the undertakings, covenants, terms, conditions, warranties, and guarantees contained in the Construction Contract, including all modifications, amendments, changes, deletions, additions, and alterations thereto that may hereafter be made, then this obligation shall be void; otherwise it shall remain in full force and effect.

Whenever the Principal shall be, and declared by the Owners to be, in default under the Construction Contract, the Surety shall promptly remedy the default as follows:

- 1) Complete the Construction Contract in accordance with its terms and conditions; or
- 2) Obtain a bid or bids for completing the Construction Contract in accordance with its terms and conditions, and upon determination by the Surety and the Owners of the lowest responsible qualified bidder, arrange for a contract between such bidder and Owners and make available as the work progresses (even though there should be a default or succession of defaults under the Construction Contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the penal sum set forth in the first paragraph hereof, as may be adjusted, and the Surety shall make available and pay to the Owners the funds required by this Paragraph prior to the payment of the Owners of the balance of the contract price, or any portion thereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the Owner to the Contractor under the Construction Contract, and any amendments thereto, less the amount paid by the Owner to the Contractor; or, at the option of the Owner;
- 3) Allow Owner to complete the work and reimburse the Owner for all reasonable costs incurred in completing the work.

In addition to performing as required in the above paragraphs, the Surety shall indemnify and hold harmless the Owner from any and all losses, liability and damages, claims, judgments, liens, costs and fees of every description, which the Owner may incur, sustain or suffer by reason of the failure or default on the part of the Principal in the performance of any or all of the terms, provisions, and requirements of the Construction Contract, including any and all amendments and modifications thereto, or incurred by the Owner in making good any such failure of performance on the part of the Principal.

The Surety shall commence performance of its obligations and undertakings under this Bond promptly and without delay, after written notice from the Owner to the Surety.

The Surety hereby waives notice of any and all modifications, omissions, additions, changes, alterations, extensions of time, changes in payment terms, and any other amendments in or about the Construction Contract, and agrees that the obligations undertaken by this Bond shall not be impaired in any manner by reason of any such modifications, omissions, additions, changes, alterations, extensions of time, change in payment terms, and amendments.

The Surety hereby agrees that this Bond shall be deemed amended automatically and immediately, without formal or separate amendments hereto, upon any amendment to the Construction Contract, so as to bind the Principal and the Surety to the full and faithful performance of the Construction Contract as so amended or modified, and so as to increase the penal sum to the adjusted contract price of the Construction Contract.

No right of action shall accrue on this Bond to or for the use of any person, entity or corporation other than the Owner and any other obligee named herein, or their executors, administrators, successors or assigns.

This bond is given pursuant to and in accordance with the provisions of O.C.G.A. Section 36-91-1 *et seq.* and all the provisions of the law referring to this character of Bond as set forth in said Sections or as may be hereinafter enacted, and these are hereby made a part hereof to the same extent as if set out herein in full.

{THIS SPACE LEFT BLANK INTENTIONALLY}

IN WITNESS WHEREOF the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed by their duly authorized representatives this _____ day of _____, 20____.

Principal

By: _____

Its: _____

Witness

Typed name of witness

Typed address of witness

(Surety)

By: _____

Its: Attorney-in-Fact

Typed name of Attorney-in-Fact

Witness

Type name of witness

Type address of witness

(Address of Surety's Home Office)

Note: Date of Bond must not be prior to date of contract.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS that _____
(hereinafter called the "Principal") and _____ (hereinafter
called the "Surety"), are held and firmly bound unto Cobb County-Marietta Water Authority
(hereinafter called the "Owner"), its successors and assigns as obligee, in the penal sum of
_____ DOLLARS (\$
), lawful money of the United States of America, for the payment of which the Principal and the
Surety bind themselves, their administrators, executors, successors and assigns, jointly and
severally, firmly by these presents.

WHEREAS, the Principal has entered, or is about to enter, into a certain written contract
with the Owner, dated _____, which is incorporated herein by reference in its
entirety (hereinafter called the "Construction Contract"), for the construction of a project known as
WYCKOFF WTP CLEARWELL #3 as more particularly described in the Construction Contract
(hereinafter called the "Project");

NOW, THEREFORE, the condition of this obligation is such that if the Principal shall
promptly make payment to all persons working on or supplying labor or materials under the
Construction Contract, and any amendments thereto, with regard to labor or materials furnished and
used in the Project, and with regard to labor or materials furnished, but not so used, then this
obligation shall be void; but otherwise it shall remain in full force and effect.

1. A "Claimant" shall be defined herein as any subcontractor, person, party, partnership,
corporation or other entity furnishing labor, services or materials used, or reasonably
required for use, in the performance of the Construction Contract, without regard to
whether such labor, services or materials were sold, leased or rented, and without regard
to whether such Claimant is or is not in privity of contract with the Principal or any
subcontractor performing work on the Project, including, but not limited to, the following
labor, services, or materials: water, gas, power, light, heat, oil, gasoline, telephone service
or rental of equipment directly applicable to the Construction Contract.
2. In the event a Claimant files a lien against the property of the Owner, and the Principal
fails or refuses to satisfy or remove it promptly, the Surety shall satisfy or remove the lien
promptly upon written notice from the Owner, either by bond or as otherwise provided in
the Construction Contract.
3. The Surety hereby waives notice of any and all modifications, omissions, additions,
changes, alterations, extensions of time, changes in payment terms, and any other
amendments in or about the Construction Contract and agrees that the obligations
undertaken by this Bond shall not be impaired in any manner by reason of any such
modifications, omissions, additions, changes, alterations, extensions of time, changes in
payment terms, and amendments.
4. The Surety hereby agrees that this Bond shall be deemed amended automatically and
immediately, without formal or separate amendments hereto, upon any amendment or

modification to the Construction Contract, so as to bind the Principal and Surety, jointly and severally, to the full payment of any Claimant under the Construction Contract, as amended or modified, provided only that the Surety shall not be liable for more than the penal sum of the Bond, as specified in the first paragraph hereof.

5. This Bond is made for the use and benefit of all persons, firms, and corporations who or which may furnish any materials or perform any labor for or on account of the construction to be performed or supplied under the Construction Contract, and any amendments thereto, and they and each of them may directly sue the Principal and the Surety hereon.
6. No action may be maintained on this Bond after one (1) year from the date the last services, labor, or materials were provided under the Construction Contract by the Claimant prosecuting said action.
7. This bond is given pursuant to and in accordance with the provisions of O.C.G.A. Section 36-91-1 *et seq.* and all the provisions of the law referring to this character of Bond as set forth in said Sections or as may be hereinafter enacted, and these are hereby made a part hereof to the same extent as if set out herein in full.

{THIS SPACE LEFT BLANK INTENTIONALLY}

IN WITNESS WHEREOF, the Principal and the Surety have hereunto affixed their corporate seals and caused this obligation to be signed by their duly authorized representatives this _____ day of _____, 20 _____. (Date of Bond must not be prior to date of contract.)

Name of Contractor as Principal

Name of Surety

By: _____
(Signature)

By: _____
(Signature)

(Typed name and title)

(Typed name) *Attorney-in-Fact*

Witness to Principal (Signature)

(Typed address of Surety's home office)

(Typed name and address of witness)

Witness to Surety (signature)

(Typed name and address of witness)

CERTIFICATION OF CONTRACTOR'S ATTORNEY

The undersigned Contractor hereby certifies one of the following:

_____ (initial) Prior to execution and delivery of the contract contained herein, the attorney has examined the attached contract, any applicable performance and payment bonds and the manner of execution thereof, as well as all other documents attached hereto and is of the opinion that upon the execution and delivery of these documents, same will constitute a valid and legally binding obligation of the undersigned contractor in accordance with the terms, conditions and provisions thereof.

Typed Name of Attorney

Signature of Attorney

Date: _____

_____ (initial) The undersigned contractor has an attorney but has not obtained any legal opinion regarding the execution and delivery of these documents.

_____ (initial) The undersigned contractor does not have an attorney and has elected not to engage an attorney regarding the execution and delivery of this contract and attached documents.

CONTRACTOR

Name of Contractor: _____

By: _____

Title: _____

Attest: _____

Title: _____

[SEAL]

CERTIFICATION OF OWNER'S ATTORNEY

The duly authorized and acting legal representatives of the OWNER do hereby certify as follows:

Prior to execution and delivery thereof by OWNER, I have examined the attached contract and any applicable performance and payment bonds and the manner of execution thereof, and I am of the opinion that upon the correction of any matters noted hereon, the foregoing contract will be ready for execution and upon execution and delivery will constitute a valid and legally binding obligation of OWNER in accordance with the terms, conditions, and provisions thereof.

Attorney For:
Cobb County - Marietta Water Authority:

By:
(Signature)

Douglas R. Haynie
(Typed name)

Date:

INSURANCE CERTIFICATE CHECKLIST

Name of Vendor/Contractor: _____
 Contract Name/Number: WYCKOFF WTP CLEARWELL #3 / 505-9005-33-19-0000
 Reviewed by: _____ Date Reviewed: _____

Workers' Compensation and Employers Liability

Effective Date: _____ Expiration Date: _____
 Are Effective Dates Current? Yes No
 Insurance Carrier: _____ A.M. Best Rating: (A- or better) _____

Coverage A: Workers' Compensation: Statutory Limits Provided Yes No
 Coverage B: Employers Liability: Limits of \$1,000,000 Provided Yes No

Does policy provide coverage for leased employees, temporary staff and
 Part-time employees? Yes No
 Are officers/owners included for coverage? Yes No

Commercial Automobile Liability

Effective Date: _____ Expiration Date: _____
 Are Effective Dates Current?
 Insurance Carrier: _____ A.M. Best Rating: (A- or better) _____

Combined Single Limit for BI/PD of at least \$1,000,000? Yes No
 Is liability coverage provided for owned/leased, hired and non-owned
 vehicles? Yes No

Commercial General Liability

Effective Date: _____ Expiration Date: _____
 Are Effective Dates Current?
 Insurance Carrier: _____ A.M. Best Rating: (A- or better) _____

Are the following policy limits provided:

\$2,000,000 General Aggregate	Yes	No
\$1,000,000 Each Occurrence	Yes	No
\$2,000,000 Products/Completed Operations	Yes	No
\$1,000,000 Personal/Advertising Injury	Yes	No
\$ 100,000 Fire Damage/Fire Legal Liability	Yes	No
\$ 5,000 Medical Expense any one person	Yes	No

Contractual Liability provided at full policy limits? Yes No
 Aggregate Limits apply Per Project/Per Job? Yes No
 Coverage stipulated for Products/Completed Operations? Yes No
 Occurrence Form or Claims Made Form? _____
 If Claims-Made is continuity date at least the start date of the project? Yes No
 Is the care, custody, control exclusion for property other than
 Contractor's property deleted? Yes No

Excess/Umbrella Liability:

Effective Date: _____ Expiration Date: _____

Are Effective Dates Current?

Insurance Carrier: _____ A.M. Best Rating: (A- or better) _____

Are the following policy limits provided:

\$5,000,000 Aggregate	Yes	No
\$5,000,000 Each Occurrence	Yes	No

Does the excess/umbrella liability policy provide additional limits above the following:

General Liability	Yes	No
Automobile Liability	Yes	No
Employers Liability	Yes	No

Is Contractual Liability coverage included at full policy limits? Yes No

Coverage stipulated for Products/Completed Operations? Yes No

Occurrence Form or Claims Made Form? _____

If Claims-Made is continuity date at least the start date of the project? Yes No

Property/Builder's Risk-Installation Floater:

Effective Date: _____ Expiration Date: _____

Are Effective Dates Current?

Insurance Carrier: _____ A.M. Best Rating: (A- or better) _____

Are policy limits provided at least equal to the value of the project? Yes No

Is a replacement cost valuation provided? Yes No

Is coverage provided for "all-risk" or special perils? Yes No

Is coverage provided for personal property in transit? Yes No

Is coverage provided for damage to property and "soft costs"? Yes No

Is boiler and machinery coverage provided? Yes No

Is coverage provided for testing and start-up? Yes No

General Requirements:

Are the Owners and Engineer included as additional insured? Yes No

Is the certificate issued to Cobb County-Marietta Water Authority? Yes No

Does the cancellation clause provide at least 30 day notice? Yes No

Is a waiver of subrogation rights included? Yes No

Is the Insurance Company's name listed on the certificate? Yes No

Does the certificate list the policy numbers next to each coverage? Yes No

Note: Continuous coverage is required for products and completed operations for a minimum of two years following completion of the job. The contractor must furnish an updated certificate of insurance for a period of two years following the completion of the job. Therefore, new certificates which show continuous general liability (including products and completed operations) or "tail liability" for claims-made policies (where the policy is not renewed/maintained) must be submitted to Cobb County-Marietta Water Authority on an annual basis for the two years following completion of the job.

Specific Requirements:

1) Insurance certificate must include the following affirmative statement: "Coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty (30) days prior written notice has been given to Owner and to each other additional insured to whom a certificate of insurance has been issued." Language stating that the Insurance Company is not responsible if the notice is not sent is not acceptable.

2) Insurance certificate must also show the following:

Owner name: Cobb County-Marietta Water Authority
Address: 1170 Atlanta Industrial Drive
Marietta, Georgia 30066

* END OF SECTION *

CONTRACT COMPLETION AFFIDAVIT

STATE OF _____

COUNTY OF _____

(1) I, _____, being duly sworn do hereby affirm that I am duly authorized to make this affidavit on behalf of _____ (hereinafter called "Contractor") as _____ of Contractor in connection with the contract dated _____, between Cobb County-Marietta Water Authority (hereinafter called "Owner") and Contractor, for construction of WYCKOFF WTP CLEARWELL #3 (hereinafter called the "Project").

(2) I affirm under oath that all work has been completed in accordance with contract provisions, and all laborers, sub-contractors and material supplier have been paid in full, and there are no suits or liens outstanding in connection with said contract or the Project.

(3) I affirm under oath that the agreed price for all of the labor, services and materials to be furnished for the Project is \$ _____, and that \$ _____ has been previously paid by Owner as progress payments for the Project.

(4) I affirm under oath that the balance of \$ _____ on said total contract price of \$ _____ is simultaneously being paid to Contractor as a final disbursement on the Project. I hereby acknowledge receipt of the same on behalf of Contractor, and I hereby acknowledge that this affidavit is made under the provisions of Official Code of Georgia Annotated Section 44-14-316.2 for the purpose of inducing Owner to pay said balance to Contractor.

(5) I affirm under oath that all of the agreed price or reasonable value of the labor, services or materials for the Project has now been paid by Owner.

(Signature of Affiant)

Sworn to and subscribed before me this _____ day of _____, 20____.

NOTARY PUBLIC

My commission expires _____.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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and

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology	1
1.01 Defined Terms.....	1
1.02 Terminology	5
Article 2 – Preliminary Matters.....	67
2.01 Delivery of Bonds and Evidence of Insurance.....	67
2.02 Copies of Documents.....	7
2.03 Commencement of Contract Times; Notice to Proceed	8
2.04 Starting the Work.....	8
2.05 Before Starting Construction.....	8
2.06 Preconstruction Conference; Designation of Authorized Representatives	9
2.07 Initial Acceptance of Schedules	9
2.08 Licensing	9
Article 3 – Contract Documents; Intent, Amending, Reuse	10
3.01 Intent.....	10
3.02 Reference Standards.....	10
3.03 Reporting and Resolving Discrepancies	11
3.04 Amending and Supplementing Contract Documents.....	12
3.05 Reuse of Documents	13
3.06 Electronic Data.....	13
Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points.....	13
4.01 Availability of Lands	13
4.02 Subsurface and Physical Conditions	14
4.03 Differing Subsurface of Physical Conditions.....	15
4.04 Underground Facilities	16
4.05 Reference Points	17
4.06 Hazardous Environmental Condition at Site.....	18
Article 5 – Bonds and Insurance	20
5.01 Performance, Payment, and Other Bonds	20
5.02 Licensed Sureties and Insurers	21
5.03 Certificates of Insurance	21
5.04 Contractor’s Insurance	21
5.05 Owner’s Liability Insurance	23
5.06 Property Insurance	23

5.07	Waiver of Rights	25
5.08	Receipt and Application of Insurance Proceeds	25
5.09	Acceptance of Bonds and Insurance; Option to Replace.....	26
5.10	Partial Utilization, Acknowledgment of Property Insurer	26
Article 6 –	Contractor’s Responsibilities	276
6.01	Supervision and Superintendence.....	276
6.02	Labor; Working Hours.....	27
6.03	Services, Materials, and Equipment	28
6.04	Progress Schedule	29
6.05	Substitutes and “Or-Equals”	30
6.06	Concerning Subcontractors, Suppliers, and Others	33
6.07	Patent Fees and Royalties	354
6.08	Permits.....	35
6.09	Laws and Regulations	35
6.10	Taxes	36
6.11	Use of Site and Other Areas	376
6.12	Record Documents.....	37
6.13	Safety and Protection	387
6.14	Safety Representative.....	398
6.15	Hazard Communication Programs	39
6.16	Emergencies	39
6.17	Shop Drawings and Samples	39
6.18	Continuing the Work.....	41
6.19	Contractor’s General Warranty and Guarantee.....	421
6.20	Indemnification	42
6.21	Delegation of Professional Design Services	43
Article 7 –	Other Work at the Site.....	44
7.01	Related Work at Site	44
7.02	Coordination.....	454
7.03	Legal Relationships.....	45
7.04	Claims Between Contractors	45
Article 8 –	Owner’s Responsibilities	46
8.01	Communications to contractor.....	46
8.02	Replacement of Engineer.....	46
8.03	Furnish Data	46
8.04	Pay When Due	46
8.05	Lands and Easements; Reports and Tests	46
8.06	Insurance	476
8.07	Change Orders.....	476
8.08	Inspections, Tests, and Approvals	476
8.09	Limitations on Owner’s Responsibilities	476
8.10	Undisclosed Hazardous Environmental Condition.....	47
8.11	Evidence of Financial Arrangements	47

8.12 Compliance with Safety Program.....	47
Article 9 – Engineer’s Status During Construction	47
9.01 Owner’s Representative	47
9.02 Visits to Site	48 7
9.03 Project Representative	48
9.04 Authorized Variations in Work	48
9.05 Rejecting Defective Work	49 8
9.06 Shop Drawings, Change Orders and Payments	49 8
9.07 Determinations for Unit Price Work	49
9.08 Decisions on Requirements of Contract Documents and Acceptability of Work	49
9.09 Limitations on Engineer’s Authority and Responsibilities.....	50 49
9.10 Compliance with Safety Program.....	50
Article 10 – Changes in the Work; Claims	51
10.01 Authorized Changes in the Work	51 0
10.02 Unauthorized Changes in the Work	51
10.03 Execution of Change Orders.....	51
10.04 Notification to Surety.....	52
10.05 Claims <u>and Disputes</u>	53 2
Article 11 – Cost of the Work; Allowances; Unit Price Work.....	54
11.01 Cost of the Work	54 3
11.02 Allowances	57
11.03 Unit Price Work	57
Article 12 – Change of Contract Price; Change of Contract Times.....	58
12.01 Change of Contract Price	58
12.02 Change of Contract Times	60 59
12.03 Delays.....	60 59
Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work.....	61
13.01 Notice of Defects	61 0
13.02 Access to Work	61 0
13.03 Tests and Inspections	61 0
13.04 Uncovering Work.....	62
13.05 Owner May Stop the Work.....	63 2
13.06 Correction or Removal of Defective Work.....	63 2
13.07 Correction Period	63
13.08 Acceptance of Defective Work.....	64
13.09 Owner May Correct Defective Work	65 4
Article 14 – Payments to Contractor and Completion.....	65
14.01 Schedule of Values	65
14.02 Progress Payments	66 5
14.03 Contractor’s Warranty of Title	71 0

14.04 Substantial Completion.....	71
14.05 Partial Utilization	73 ⁷³²
14.06 Final Inspection.....	73
14.07 Final Payment.....	73
14.08 Final Completion Delayed.....	75 ⁷⁵⁴
14.09 Waiver of Claims	75
 Article 15 – Suspension of Work and Termination.....	 75
15.01 Owner May Suspend Work	75
15.02 Owner May Terminate for Cause	76 ⁷⁶⁵
15.03 Owner May Terminate For Convenience.....	77
15.04 Contractor May Stop Work or Terminate	78 ⁷⁸⁷
 Article 16 – Dispute Resolution	 79 ⁷⁹⁸
16.01 Methods and Procedures.....	79 ⁷⁹⁸
 Article 17 – Miscellaneous	 79 ⁷⁹⁸
17.01 Giving Notice.....	79 ⁷⁹⁸
17.02 Computation of Times	80 ⁸⁰⁷⁹
17.03 Cumulative Remedies	80 ⁸⁰⁷⁹
17.04 Survival of Obligations.....	80 ⁸⁰⁷⁹
17.05 Controlling Law	80 ⁸⁰⁷⁹
17.06 Headings.....	80
17.07 Addresses	81 ⁸¹⁰
17.08 Forms and Record.....	81 ⁸¹⁰
17.09 Assignment.....	82 ⁸²⁴

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. 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 which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer 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, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 01 of the Specifications. The General Requirements are applicable to all Sections of the Specifications and to the entire Work.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

- 25.1 Liquidated Damages – amounts shall be as stipulated in the Agreement. Liquidated damages shall apply to the Contract Times for the Project. Liquidated Damages shall be both additive and cumulative. Liquidated Damages shall end upon Substantial Completion, Completion of the Work associated with each Milestone Date, and upon final completion of the Work.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given 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 under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *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.
40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *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 at the Site.
44. *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 to provide the following: (i) the Owner full time, uninterrupted, continuous operation of the work; and (ii) all required functional, performance, and operational or startup testing has been successfully demonstrated for all components, devices, equipment, and systems to the satisfaction of the Engineer in accordance with the requirements of the Specifications; and (iii) all required inspections and other work necessary for the Engineer to certify "substantially complete" have been completed. ~~, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended.~~ The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof. See General Conditions Paragraph 14.04 for additional provisions.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *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, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

- A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed,” “as required” 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 requirements of and the information in the Contract Documents and compliance 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 Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

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

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

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

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

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

- ~~B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.~~
- A. When Contractor delivers the executed Agreements to Owner, Contractor shall also deliver to Owner such Bonds and Certifications of Insurance as Contractor may be required to furnish in accordance with Article 5.
- B. Contract, Performance Bond and Payment Bond shall not be dated prior to submittal to the Owner so that all three can be filled in by the Owner with the same date.
- C. Certified copy of Power of Attorney for Performance Bond and Payment Bond must be dated prior to submittal to the Owner with a date which is within the previous fifteen days.
- D. Performance Bond, Payment Bond and Certified Copy of Power of Attorney must have corporate seal of surety.
- E. Signature of attorney-in-fact for surety company on Performance Bond and Payment Bond must be one of persons authorized to sign on certified copy of Power of Attorney.
- F. The copy of Contract Documents to be kept by the Owner must have original signed certificate version of the certified Power of Attorney. Other copies may have copies of the certificate.
- G. If Contractor is a corporation, Contract, Performance Bond and Payment Bond must have corporate seal of Contractor affixed, must show title of person signing on behalf of Contractor and must be attested by Secretary or Assistant Secretary.
- H. The Payment Bond and the Performance Bond must be on Owner's forms, included herein.
- I. Surety company must be shown on the current Department of the Treasury Circular 570, Surety Companies Acceptable on Federal Bonds, with an underwriting limitation greater than the amount of the Contract.

2.02 *Copies of Documents*

- A. Owner shall will furnish to Contractor up to ten-four printed or hard copies of the Drawings and Project Manual Contract Documents and one counterpart of the executed Contract Agreement. Additional copies will be furnished upon request at the cost of reproduction.
- B. Owner may also, if requested by Contractor, furnish Contractor with electronic copies of the Drawings and other Contract Documents. Contractor agrees it will only use the same for performing the Work and will not disseminate the same except to its subcontractors where necessary to perform the Work. Contractor shall obtain written acceptance of any subcontractor to these limitations before disseminating the same to such subcontractor. Electronic copies of the Contract Documents will be provided as a convenience to the

Contractor. The Owner and Engineer assume no liability and shall be held harmless for any discrepancies between the hard copy and electronic copy of the Contract Documents.

(See Supplementary Conditions 2.02.B.1)

2.03 *Commencement of Contract Times; Notice to Proceed*

A. ~~The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated~~date established in the Notice to Proceed. A Notice to Proceed may be given at any time within ~~30-60~~ days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the ~~sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier~~ one-hundred and twentieth day after the Owner receives copies of the Agreement properly executed by the Contractor and the Bonds, evidence of proper insurance and other materials required by the Notice of Award.

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

A. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

B. *Preliminary Schedules:* Within 10 days after the ~~Commencement of the Contract Time~~Effective Date of the Agreement (unless otherwise specified in the General Requirements), 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 Documents;
2. a preliminary Schedule of Submittals; which indicates each required Submittal and the dates for submitting, time for reviewing and processing each Submittal (periodic Submittals may be listed by a common monthly date); 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~~ in a format acceptable to the Engineer and in accordance with the requirements specified in the General Requirements.

2.06 *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 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, 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 instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. ~~At least 10 days before submission of the first Application for Payment a~~ Within ten days after the preconstruction conference a conference attended by Contractor, Owner, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer as being the Contractor's schedule for the 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. The Progress Schedule may subsequently be adjusted in accordance with Paragraph 6.04 and applicable provisions of the General Requirements.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals. The Schedule of Submittals may subsequently be adjusted in accordance with Paragraph 6.04 and applicable provisions of the General Requirements.
 3. Contractor's Schedule of Values will be acceptable to the Engineer as to form and substance if it is provided in accordance with the requirements specified in the General Requirements, ~~provides a reasonable allocation of the Contract Price to component parts of the Work.~~

2.08 *Licensing*

Before any work at the site is started which is governed by the Construction Industry Licensing Board of Georgia (O.C.G.A. Section 43-14-1 et seq and Section 43-41 et seq), or its rules or

regulations, Contractor shall inform himself of those rules and regulations, and qualifications for licensure, and if requested shall deliver proof of compliance to the Owner and Engineer.

ARTICLE 3 – CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The individual components of the Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.
- D. Where the word “similar” occurs in the Contract Document, it shall have a general meaning and not be interpreted as being identical, and all details shall be worked out in relation to their location and their connection with other parts of the Work.
- E. Each and every clause or other provision required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be amended to make such insertion.
- F. “Imperative” or “Command” type language is used in the Contract Documents. This command language refers to and is directed to the Contractor.
- G. Emphasis, such as italics or quotes, has been used throughout the Contract Documents. Use of emphasis shall not change the meaning of the term emphasized.
- H. ~~Special Specifications stated on the Drawings govern that particular part of the Work and have equal weight and importance as the printed Specifications.~~

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 - 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement 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, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, 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) any standard, specification, manual, or code, or (c) 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 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
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 Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); 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).

2. In resolving inconsistencies within the Contract Documents, precedence shall be given in the following descending order:

- a. Change Orders.
- b. Work Change Directives.
- c. Field Orders.
- d. Engineer's written interpretations and clarifications.
- e. Notice to Proceed.
- f. Addenda.
- g. Contract Agreement.
- h. Supplementary Conditions.
- i. General Conditions.
- j. Specifications.
- k. Drawings:
 - i. Figure dimensions on Drawings shall take precedence over scaled dimensions.
 - ii. Detailed drawings shall take precedence over general drawings.
 - iii. In case of discrepancy between small-scale detail and large-scale detail, the large-scale detail shall govern. On any of the Drawings where a portion of the Work is drawn out and the remainder is shown in outline, the portion drawn out shall apply also to all other like portions of the Work.
- l. Bidding Requirements.

3. In cases where products or quantities are omitted from the Specifications, the description and quantities on the Drawings shall govern.

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:
 1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 2. 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.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

**ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS;
HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS**

4.01 *Availability of Lands*

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

comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

- 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 the Work is to be performed 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.
- D. The Owner has begun to obtain all lands, rights-of-way and easements as indicated in the Contract Documents however, delays obtaining such lands may occur. If the Owner is unable to obtain lands as indicated in the Contract Documents, the Owner will notify the Contractor of those lands which are not yet acquired and those areas where lands are available. Contractor shall begin the Work upon such land and rights-of-way as Owner has acquired.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports ~~known to Owner~~ of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by the Engineer in preparing the Contract Documents; -and
 - 2. those drawings ~~known to Owner~~ of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been utilized by the Engineer in preparing the Contract Documents.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions, or information.

[See Supplementary Conditions 4.02.C, 4.02.D and 4.02.E]

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer’s Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner’s obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer’s findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition 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 meet any one or more of the categories described in Paragraph 4.03.A; and
 - 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 Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

- a. Contractor knew of the existence of such conditions at the time Contractor made a final 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
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, 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 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

C. The dimensions and descriptions given on the Drawings for adjacent work by others, if any, (including any existing facilities or utilities previously constructed for Owner) are based on the design drawings and not as-built drawings. Prior to commencing the Work, the Contractor shall verify all as-built conditions and information whenever existing facilities or utilities may impact the Work. Failure of Contractor to so verify all as-built conditions prior to commencing the Work shall bar Contractor from later seeking additional compensation for conflicts with existing facilities or utilities.

D. Prior to the construction or installation of any proposed facility or pipeline, the Contractor shall expose all existing utilities true to their vertical and horizontal location, within the vicinity of the Work. In order to avoid conflicts between existing and proposed facilities or utilities, the Contractor shall either relocate the existing or proposed utility on a temporary or permanent basis, or shall take whatever means necessary to protect the existing facilities or utilities during the installation of proposed utilities, as approved by the Engineer. No additional payment will be made for the relocation of existing utilities or for any work associated with the protection of existing facilities or utilities.

4.05 *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~~Engineer. 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.

- B. Engineer may check the lines, elevations, and reference marks set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for accurate construction of the entire Work.
- C. The Contractor shall review the Contract Documents and the Project site to determine the presence and location of any property or rights-of-way monuments or markers, and to assess the possibility of disruption to these monuments or markers. It will be the Contractor's responsibility to flag, erect guard posts, or provide offset references for the protection or the re-monumentation of these property or rights-of-way monuments or markers. In the event these monuments or markers are covered over or disturbed, it will be the Contractor's responsibility to employ a surveyor licensed in the state of Georgia to re-establish those monuments or markers of property or rights-of-way, which were present prior to Work on the Project.
- D. It shall be the Contractor's responsibility to verify all reference points shown on the Contract Documents prior to beginning Work on the site. This verification shall be conducted by professionally qualified personnel in a manner which will verify the accuracy of the information shown in the Contract Documents. On projects which involve the connection to, or additions to existing structures, the elevations of these existing structures shall also be verified. Any findings which differ from those shown on the Contract Documents shall be submitted in writing to the Engineer for resolution.
- E. Additional surveys necessary for the construction staking shall be performed by the Contractor, the cost of which shall be incorporated into the appropriate items of Work. On projects in which payment is classified by depth of cut, the construction staking shall be performed in a manner that will allow for the determination of cut classification. During construction of the project, the Contractor shall keep a daily log and record of the location of all underground pipes, all structures, and any deviation from the Drawings. The Contractor shall keep and furnish this daily log and record in a manner which will allow the Engineer to incorporate these items into the Contract Documents.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) 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 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. 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 issue a Work Change Directive or Change Order as appropriate. ~~order the portion of the Work that is in the area affected by such condition to be deleted from the Work.~~ If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. ~~To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other~~

~~dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.~~

- H. 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 a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment ~~becomes due~~ is made by the Owner or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers [See Supplementary Conditions SC-5.02]*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as ~~may be provided below in the Supplementary Conditions.~~

1. Surety shall be in good standing with Georgia's Insurance Commissioner's Office.
2. Surety and Insurers must have an A.M. Best Financial Strength Rating and a Financial Size Category as stated in the insurance requirements specified elsewhere in these Contract Documents.
3. The surety shall have an underwriting limitation in Circular 570 in excess of the Contract Price.

5.03 *Certificates of Insurance [See Supplementary Conditions SC-5.03]*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain, if any.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance [See Supplementary Conditions SC-5.04]*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or

result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:
 - a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
 5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the

Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

C. The limits of liability for the insurance required by paragraph 5.04.B.2 of the General Conditions shall provide coverage specified in the Supplementary Conditions or greater where required by Laws and Regulations.

D. Any renewal of a policy shall have an original retroactive date no later than the date of the Contract.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance [See Supplementary Conditions SC-5.06]*

- A. Unless otherwise provided in the Supplementary Conditions, ~~Owner~~Contractor shall purchase and maintain property insurance as required in the Supplementary Conditions.

~~upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:~~

- ~~1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;~~
- ~~2. be written on a Builder's Risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and~~

~~equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.~~

- ~~3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);~~
- ~~4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;~~
- ~~5. allow for partial utilization of the Work by Owner;~~
- ~~6. include testing and startup; and~~
- ~~7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.~~

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

~~C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.~~

~~D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.~~

~~E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order.~~

~~Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.~~

5.07 *Waiver of Rights*

- A. ~~Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 by Contractor will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner/Contractor as trustee or otherwise payable under any policy so issued.~~
- B. ~~Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:~~
- ~~1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and~~
 - ~~2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.~~
- C. ~~Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.~~

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may

appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

- B. Owner as ~~fiduciary~~ shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as ~~fiduciary~~ shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as ~~fiduciary~~ shall adjust and settle the loss with the insurers.

~~and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.~~

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If ~~either Owner or Contractor~~ has any objection to the coverage afforded by or other provisions of the ~~bonds or insurance~~ required to be purchased and maintained by ~~the other party~~ Contractor in accordance with this Article 5 on the basis of non-conformance ~~it is not complying with the Contract Documents, the objecting party shall so~~ Owner will ~~notify the other party~~ Contractor in writing thereof within ten ~~10~~ days after receipt of the certificates ~~(or other evidence requested) required by~~ of the date of delivery of such certificate to Owner in accordance with Paragraph 2.01.B. ~~Owner and Contractor shall each provide to the other such additional information in respect of insurance provided by Contractor as the other~~ Owner may reasonably request. If ~~either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, 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. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.~~

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 –CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, provide quality control, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. Contractor shall also designate, in writing, a representative, hereinafter referred to as Project Manager, assigned to the Project on a full-time basis during execution of the Work who shall have the authority to act on behalf of Contractor, including executing the orders or directions of the Engineer without delay. This Superintendent and/or Project Manager shall have full authority to promptly supply products, tools, plant equipment, and labor as may be required to diligently prosecute the Work. All communications given to or received from the Superintendent and/or the Project Manager shall be binding on Contractor.
- C. If at any time during the Project the Superintendent or Project Manager leaves the Project site while Work is in progress, Engineer shall be notified and provided with the name of Contractor’s representative having responsible charge.
- D. Contractor shall also designate the person responsible for Contractor’s quality control while Work is in progress. Engineer shall be notified in writing prior to any change in quality control representative assignment.
- E. Prior to the Commencement of the Contract Times, Contractor shall furnish to the Owner and Engineer the names, resumes, 24-hour contact information and other relevant information associated with the Project Manager and the Superintendent that are to be assigned to this project. The Project Manager and Superintendent must be acceptable to the Owner and Engineer.

6.02 *Labor; Working Hours [See Supplementary Conditions SC-6.02]*

- A. Contractor shall provide competent, skilled, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site. Contractor shall, upon demand from the Engineer, immediately remove any manager, superintendent, foreman or workman whom the Engineer or Owner may consider incompetent or undesirable.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the

performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

- C. Regular working hours may be Monday through Friday, excluding holidays, occurring between the hours of 7:00 AM and 7:00 PM, unless restricted otherwise. Contractor shall establish a 40-hour work week with regular scheduled work times, e.g., four 10-hour days or five 8-hour days, -within the hours and days allowed above. Approval for specific work outside regular scheduled work times shall be requested no less than 48 hours prior to the requested work period. Contractor shall request approval of changes in regular scheduled work times no less than one week prior to the desired change. Occasional unscheduled overtime on weekdays may be permitted provided reasonable notice is given to Engineer.
- D. Contractor shall pay all extra costs incurred by the Owner associated with work, outside of regular working hours, including additional support services, inspection services, testing services, utilities or other applicable costs. The cost associated with the Owner's inspection overtime will be the amounts as provided in the Supplementary Conditions per hour per individual, depending upon individuals assigned to the Project, the type of work being inspected, and the date of the invoice; i.e., allowing for salary escalation. Contractor will not be responsible for extra costs associated with inspection overtime for work in excess of 50 hours per week when such overtime work is explicitly required by the Contract Documents.
- E. Except in the case of emergencies or other unusual circumstances, no work shall be permitted on the project on Sunday.
- F. The Engineer will determine to what extent extraordinary onsite personnel work is required during Contractor's overtime work or working hours outside regular scheduled work hours.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, quality control, testing, start-up, and completion of the Work.
- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All products (material and equipment) provided on this Project shall be new and unused and provided by the Contractor unless specified otherwise, shall be products currently manufactured by the manufacturer, i.e., products shall not be discontinued or out-of-date products nor shall they be of the last production run of the product. Contractor shall incorporate the previous sentence in any contract or agreement between Contractor and subcontractor or supplier supplying products provided on this Project. All special warranties and guarantees required by the SpecificationsContract Documents shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.
- D. Without limiting the responsibility or liability of the Contractor pursuant to this agreement, all warranties given by manufacturers on materials or equipment incorporated in the work are hereby assigned by the Contractor to the Owner. Such assignment shall be effective upon completion of Contractor's warranty period. If requested, the Contractor shall execute formal assignments of said manufacturer's warranties to the Owner. All such warranties shall be directly enforceable by the Owner. Such assignment shall in no way affect the Contractor's responsibilities and duties during the warranty period.

6.04 *Progress Schedule*

- A. The Contractor shall proceed with the Work at a rate of progress which will ensure completion within the Contract Time. It is expressly understood and agreed by and between the Contractor and the Owner, that the Contract Times for the Work described herein are reasonable times, taking into consideration the average climatic and economic conditions, and other factors prevailing in the locality of the Work.
- BA. Contractor shall provide all resources, labor, materials, equipment, services, etc. necessary to adhere to the Progress Schedule established in accordance with Paragraph 2.07 and the General Requirements 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 2.07) proposed adjustments in and the General Requirements) an updated ~~the~~ Progress Schedule that will not result in changing the Contract Times and an updated Schedule of Submittals with each partial payment request, but no less than monthly. Contractor's failure to provide acceptable updated Progress Schedule and Schedule of Submittals will delay processing of the pay request until receipt of the acceptable updated Progress Schedule and/or an updated Schedule of Submittals. Such adjustments will updates and adjustments shall comply with any provisions of the General Requirements applicable thereto.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.
 3. Number of anticipated days associated weather conditions, as defined in the General Requirements, shall be included on the critical path of Project Schedule.
- C. If the Progress Schedule reflects a completion date prior to the completion date established by the Agreement, this shall afford no basis to claim for delay should Contractor not complete the Work prior to the projected completion date. Instead, all "float" between the completion date in Contractor's schedule and the completion date established in the Agreement shall belong to and is exclusively available to the Owner. Should a change order be executed with a revised completion date, the Progress Schedule shall be revised to reflect the new completion date.

- D. Project Coordination Meetings: The Contractor shall participate in Project Coordination Meetings to be held on the site monthly, or more often if conditions warrant, to establish the current state of completion and revise the schedule as necessary. The Project Coordination Meeting will be conducted by the Owner and/or the Engineer.
- E. The Contractor shall implement the detailed schedule of activities to the fullest extent possible between Project Coordination Meetings.
- F. The Contractor shall prepare its daily report by 10:00 a.m. of the day following the report date. This daily report will contain, as a minimum, the weather conditions; number of workers by craft, including supervision and management personnel on site; active and inactive equipment on site; work accomplished by schedule activity item; problems; and visitors to the jobsite.
- G. If a current activity or series of activities on the overall project schedule is behind schedule and if the late status is not due to an excusable delay for which a time extension would be forthcoming, the Contractor shall attempt to reschedule the activity to be consistent with the overall Project Schedule so as not to delay any of the Contract milestones. The Contractor agrees that:
1. The Contractor shall attempt to expedite the activity completion so as to have it agree with the overall progress schedule. Such measures as the Contractor may choose shall be made explicit during the Project Coordination Meeting.
 2. If, within two weeks of identification of such behind-schedule activity, the Contractor is not successful in restoring the activity to an on schedule status, the Contractor shall:
 - a. Carry out the activity with the scheduled crew on an overtime basis until the activity is complete or back on schedule.
 - b. Increase the crew size or add shifts so the activity can be completed as scheduled.
 - c. Commit to overtime or increased crew sizes for subsequent activities, or some combination of the above as deemed suitable by the Engineer.
 3. These actions shall be taken at no increase in the Contract Price.
- H. The Contractor shall maintain a current copy of all construction schedules on prominent display in the Contractor's field office at the Project site.
- I. The Contractor shall cooperate with the Owner and Engineer in all aspects of the Project scheduling system. Failure to implement the Project scheduling system or to provide specified schedules, diagrams and reports, or to implement actions to re-establish progress consistent with the overall progress schedule may be causes for withholding of payment.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description 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 or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *“Or-Equal” Items:* If in Engineer’s sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an “or-equal” item, in which case review and approval of the proposed item may, in Engineer’s sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

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

- 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
- 3) it has a proven record of performance and availability of responsive service.

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

- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
- 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

a. If in Engineer’s sole discretion an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

- 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
- 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) 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
 - c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
- 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. 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.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others* ~~*[See Supplementary Conditions SC 6.06]*~~

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Acceptance of any Subcontractor, other person or organization by Owner shall not constitute a waiver of any right of Owner to reject defective Work. Contractor shall not be required to employ any Subcontractor, ~~Supplier,~~ or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection. If more than twenty-five percent of the work (as measured by dollar value and not including specialty work that is customarily subcontracted) is to be performed by one or more subcontractors then Contractor is obligated to notify Owner in writing of this intent with the submission of the Bid and to provide such supplemental information within five days of the bid as outlined under section 11 of INSTRUCTIONS TO BIDDERS.
- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, ~~and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued.~~ No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier ~~will~~ shall be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. ~~Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.~~
- H. Owner or Engineer may furnish to any Subcontractor, Supplier or other person or organization, to the extent practicable, information about amounts paid on their behalf to Contractor in accordance with Contractor's Applications for Payment.
- I. Specialty Subcontractors: Contractor shall utilize the services of Specialty Subcontractors on those parts of the Work which is declared as specialty work in Specifications and which, under normal contracting practices, is best performed by Specialty Subcontractors, as required by the Engineer in Engineer's sole discretion, at no additional cost to the Owner. If Contractor desires to self-perform specialty work, Contractor shall submit a request to the Owner, accompanied by evidence that Contractor's own organization has successfully performed the type of work in question, is presently competent to perform the type of work, and the performance of the work by Specialty Subcontractors will result in materially increased costs or inordinate delays.

~~J. The Contractor shall perform a minimum of 20 percent of the onsite labor with its own employees.~~

J. The Contractor shall perform a minimum of 50 percent of the onsite labor with its own employees.

K. All pipe installation must be performed by the general contractor or subcontractor that has been prequalified by the Cobb County-Marietta Water Authority for the installation of 48" ductile iron pipe.

6.07 *Patent Fees and Royalties*

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

6.08 *Permits [See Supplementary Conditions SC-6.08]*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work-

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear 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. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.
- D. The Contractor shall keep fully informed of all laws, ordinances and regulations of the federal, state, county, city and municipal governments or authorities in any manner affecting those engaged or employed in the Work or the materials used in the Work or in any way affecting the conduct of the Work and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same.
 - 1. Security and Immigration Act: Contractor and its Subcontractors shall register and comply with OCGA 13-10-90 et. seq. and Georgia Department of Labor Chapter 300-10-1.
- E. Contractor shall perform those duties as they relate to O.C.G.A. Section 36-91-92, including filing the Notice of Commencement. Contractor shall provide Owner and Engineer with proof of having performed these duties before any progress payments or final payment shall be considered due and payable to the Contractor.
- F. Where professional engineering and/or architectural services are required in connection with any of the components required by the Contract, all Bidders and component suppliers must make certain that there is full compliance with all applicable laws of the State of Georgia and any other state governing professional engineering and/or architecture. The Owner and Engineer do not warrant that any entity listed as an acceptable manufacturer is or will be in compliance with such laws.
- G. Any fines levied against the Owner for failure of Contractor to properly maintain required NPDES erosion and sediment control measures or any other related requirements will be deducted as set-offs from payments due Contractor.

6.10 *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.

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. 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 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 by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site 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 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 property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written

interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings ~~will~~shall be delivered to Engineer for Owner. See General Requirements for additional requirements.

6.13 *Safety and Protection [See Supplementary Conditions SC-6.13]*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all ~~necessary~~ precautions for the safety of, and shall provide the ~~necessary~~ protection to prevent pollution of or 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, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the

fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. The property, improvements or facilities at the Site shall be replaced or restored to a condition as good as when Contractor entered upon the Site. In case of failure on the part of Contractor to restore such property, or make good such damages or injury, the Owner may, after 48 hours written notice, or sooner in the case of an emergency, proceed to repair, rebuild, or otherwise restore such property, improvements or facilities as may be deemed necessary. The cost thereof will be deducted from any monies due or which may become due Contractor under this Contract.

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted or adjusted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

a. Submit number of copies specified in the General Requirements Specifications.

- b. Data shown on the Shop Drawings ~~shall~~ will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. 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 6.17.D.

B. 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. *Submittal Procedures:*

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

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
- c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

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

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

D. *Engineer's Review:*

1. Engineer will return as incomplete or will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval or disapproval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval or disapproval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.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's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

F. Excessive Submittal Resubmission: Engineer will record time required by Engineer for excessive submittal review occasioned by Contractor's resubmission, in excess of two resubmissions of any required submittal, caused by unverified, unchecked or unreviewed, incomplete, inaccurate or erroneous, or nonconforming submittals. Upon receipt of Engineer's accounting of time and costs, Contractor will reimburse Owner for the charges of Engineer's review for excessive resubmissions through set-offs from the recommended Owner payments to Contractor as established in Paragraph 14.02.D. of these General Conditions.

G. In the event that Contractor provided a submittal for a previously approved item, whether such is as a substitution or in addition to the previously approved item, Contractor shall reimburse Owner for Engineer's charges for such time as may be required to perform all reviews of the substitute item, unless the change is specifically requested by the Owner.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any

disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by Engineer;
 - 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 or the issuance of a notice of acceptability by Engineer;
 - 6. any inspection, test, or approval by others; or
 - 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. 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 performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but

only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity. If through the negligent act or omission on the part of Contractor, any other contractor or any subcontractor shall suffer loss or damage on the Work, Contractor shall settle with such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractor will so settle. If such other Contractor or Subcontractor shall assert any claim against Owner and/or Engineer on account of any damage alleged to have been sustained, Owner shall notify Contractor, who shall indemnify and save harmless Owner and Engineer against any such claims.

- 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 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor ~~under Paragraph 6.20.A~~ shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the negligent preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 2. negligently giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

D. Contractor, Subcontractors, Suppliers and others on the Project, or their sureties, shall maintain no direct action against the Engineer, their officers, employees, affiliated corporations, consultants, and subcontractors, for any claim arising out of, in connection with, or resulting from the engineering services performed. Only the Owner will be the beneficiary of any undertaking by the Engineer.

6.21 *Delegation of Professional Design Services*

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

- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. 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. The duties and

responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, 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.

7.02 *Coordination*

- A. If Owner ~~intends to contract~~ with others for the performance of other work on the ~~Project at the Site~~, the following will be set forth in Supplementary Conditions:
1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination with other contractors.
- C. If Owner contracts with others for the performance of other work on the Site, the Contractor shall attend and participate in coordination meetings with the other on-site contractors.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

7.04 Claims Between Contractors

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

- B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold Owner, Engineer, and the officers, directors, employees, agents, and other consultants of each and any of them harmless 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 directly, indirectly or consequentially out of or resulting from any action, legal or equitable, brought by any separate contractor against Owner, Engineer, or the officers, directors, employees, agents, and other consultants of each and any of them to the extent based on a claim arising out of Contractor's performance of the Work. Should a separate contractor cause damage to the Work or property of Contractor or should the performance of work by any separate contractor at the Site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or the officers, directors, employees, agents, and other consultants of each and any of them or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any mediator or arbitrator which seeks to impose liability on or to recover damages from Owner, Engineer, or the officers, directors, employees, agents, or other consultants of each and any of them on account of any such damage or claim.
- C. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable hereto, Contractor may make a claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, and/or Engineer and the officers, directors, employees, agents, or other consultants of each and any of them for any delay, disruption, interference or hindrance caused by any separate contractor. This Paragraph does not prevent recovery from Owner and Engineer for activities that are their respective responsibilities.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer ~~to whom Contractor makes no reasonable objection,~~ whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

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

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *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.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

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 pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *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 Documents.

9.02 *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 9.09. 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.

9.03 *Project Representative [See Supplementary Conditions SC-9.03]*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which 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. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or

Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will have authority to determine the actual quantities and classifications of Unit Price Work performed by Contractor. If Engineer exercises such authority, Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty 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 Paragraph 14.07.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, except that Owner shall determine whether bonds, certificates of insurance and release of liens comply with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *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 by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
1. Owner may, in anticipation of possibly ordering an addition, deletion or revision to the Work, request Contractor to prepare a proposal of cost and times to perform Owner's contemplated changes in the Work. Contractor's written proposal shall be transmitted to the Engineer promptly, but not later than fourteen days after Contractor's receipt of Owner's written request and shall remain a firm offer for a period not less than sixty days after receipt by Engineer.
 2. Contractor is not authorized to proceed on an Owner contemplated change in the Work prior to Contractor's receipt of a Change Order (or Work Change Directive) incorporating such change into the Work.
 3. Owner's request for proposal or Contractor's failure to submit such proposal within the required time period will not justify a claim for an adjustment in Contract Price or Contract Times (or Milestones).
 4. The Owner shall not be liable to the Contractor for any costs associated with the preparation of proposal associated with the Owner's contemplated changes in the Work.
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *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 as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

B. In signing a Change Order, the Owner and Contractor acknowledge and agree that:

1. The stipulated compensation (Contract Price or Contract Time, or both) set forth in the Change Order includes payment for:
 - a. the Cost of the Work covered by the Change Order,
 - b. Contractor's fee for overhead and profit,
 - c. interruption of Progress Schedules,
 - d. delay and impact, including cumulative impact, on other work under the Contract Documents, and
 - e. extended home office and jobsite overhead;
2. the Change Order constitutes full mutual accord and satisfaction for the change to the Work;
3. No reservation of rights to pursue subsequent claims on the Change Order will be made by either party; and
4. No subsequent claim or amendment of the Contract Documents will arise out of or as a result of the Change Order.

10.04 *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.

10.05 Claims and Disputes

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than ~~30~~14 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with written supporting data shall be delivered to the Engineer and the other party to the Contract within ~~60~~21 days (and monthly thereafter for continuing events) after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).
- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, ~~unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.~~
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:
1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

- a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
- b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
- c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
 1. Full rental cost for rented, leased, and/or owned equipment shall not exceed the rates listed in the Rental Rate Blue Book published by Equipment Watch, a unit of Primedia, Inc., as adjusted to the regional area of the Project. The most recent published edition in effect at the commencement of the actual equipment use shall be used.
 2. Rates shall apply to equipment in good working condition. Equipment not in good condition, or larger than required, may be rejected by Engineer or accepted at reduced rates.
 3. Equipment in Use: Actual equipment use time documented by the Engineer shall be the basis that the equipment was on and utilized at the Project site. In addition to the leasing rate above, equipment operational costs shall be paid at the estimated operating cost, payment category (and the table below), and associated rate set forth in the Blue Book if not already included in the lease rate.

The hours of operation shall be based upon actual equipment usage to the nearest full hour, as recorded by the Engineer.

<u>Actual Usage</u>	<u>Blue Book Payment Category</u>
<u>Less than 8 hours</u>	<u>Hourly Rate</u>
<u>8 or more hours but less than 7 days</u>	<u>Daily Rate</u>
<u>7 or more days but less than 30 days</u>	<u>Weekly Rate</u>
<u>30 days or more</u>	<u>Monthly Rate</u>

4. Equipment when idle (Standby): Idle or standby equipment is equipment on-site or in transit to and from the Work site and necessary to perform the Work under the modification but not in actual use. Idle equipment time, as documented by the Engineer, shall be paid at the leasing rate determined in 11.01.A.5.c., excluding operational costs.
 5. Where a breakdown occurs on any piece of equipment, payment shall cease for that equipment and any other equipment idled by the breakdown. If any part of the Work is shutdown by the Owner, standby time will be paid during non-operating hours if diversion of equipment to other Work is not practicable. Engineer reserves the right to cease standby time payment when an extended shutdown is anticipated.
- 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 any of the Work that has been completed and accepted by the Owner, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D.), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee. If, however, any such loss or damage to the Work that has been accepted by Owner requires reconstruction and Contractor is placed in charge thereof, Contractor shall be paid for services, a fee proportionate to that stated in Paragraph 12.01.c.
 - g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as telegrams, long distance telephone calls, telephone 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 Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, 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 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 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:*
1. Contractor agrees that:
 - a. 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
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *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. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- 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. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work; and
 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for 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, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a ~~mutually agreed~~ lump sum value fixed by the Owner or by unit price values fixed by the Owner (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and ~~agreement to a lump sum is not reached~~ where the methods under Paragraph 12.01.B.2, are not selected by the Owner, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:
1. a mutually acceptable fixed fee; or
 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent based on subcontractor's actual Cost of the Work;
 - 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 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor; except the maximum total allowable cost to Owner shall be the Cost of the Work plus a maximum collective aggregate fee for Contractor and all tiered Subcontractors of 26.8 percent.
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, quarantine restrictions, strikes, freight embargoes, acts of war (declared or not declared), or acts of God.
- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

- A. Contractor is responsible for the initial and subsequent inspections of Contractor's Work to ensure that the Work conforms to the requirements of the Contract Documents. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests. Contractor shall establish an inspection program and a testing plan acceptable to the Engineer and shall maintain complete inspection and testing records available to Engineer.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all non-contractor inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- 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 and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in

the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

- E. 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.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.
- G. Tests required by Contract Documents to be performed by Contractor and that require test certificates to be submitted to Owner or Engineer for acceptance shall be made by an independent testing laboratory or agency licensed or certified in accordance with Laws and Regulations and applicable state and local statutes. In the event state license or certification is not required testing laboratories or agencies shall meet the following applicable requirements:
 - 1. "Recommended Requirements for Independent Laboratory Qualification". published by the American Council of Independent Laboratories.
 - 2. Basic requirements of ASTM E329, "Standard of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable.
 - 3. Calibrate testing equipment at reasonable intervals by devices of accuracy traceable to either the National Bureau of Standards or accepted values of natural physical constants.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, 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, furnishing all necessary labor, material, and equipment.
- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such 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 Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

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

B. If Owner stops Work under Paragraph 13.05.A. Contractor shall not be entitled to an extension of Contract Times or increase in Contract Price.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

C. Contractor shall promptly segregate and remove rejected products from the Site.

D. If rejected products or Work is not removed within 48 hours, the Engineer will have the right and authority to stop the Work immediately and will have the right to arrange for the removal of said rejected products or Work at the cost and expense of the Contractor.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.
- F. Repetitive malfunction of an equipment or product item shall be cause for replacement and an extension of the correction period to a date one year following acceptable replacement. A repetitive malfunction shall be defined as the third failure of an equipment or product item following original acceptance.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) 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 pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary

revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time as defined by the Engineer after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, 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, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, 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 (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. 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 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A and as modified will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments* [See Supplementary Conditions SC 14.02]

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, 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 9.07, 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 Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. ~~Ten-Forty-five~~ days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. 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;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action 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, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.
4. Items entitling Owner to retain set-offs from the amount recommended, include but are not limited to:
 - a. Owner compensation to Engineer at an estimated average rate as specified in the Supplementary Conditions per each extra personnel hour for labor plus expenses because of the following Contractor-caused events:
 - (1) Delays necessitating a time extension for the performance of Engineer's services;
 - (2) Witnessing retesting of corrected or replaced defective Work;
 - (3) Return visits to manufacturing facilities to witness factory testing or retesting;

(4) Submittal reviews in excess of three reviews by Engineer for substantially the same Submittal;

(5) Evaluation of proposed substitutes and in making changes to Contract Documents occasioned thereby;

(6) Hours worked by Contractor, in excess of normal work hours as defined by Article 6.02 of the General Conditions, necessitating Engineer to work overtime;

(7) Return visits to the Project by Engineer for Commissioning Activities not performed on the initial visit;

b. Fines levied against the Owner for Contractor's performance of NPDES Erosion and Sedimentation Control Measures or other permit violations.

c. The cost of repair, rebuilding or restoration of property improvements or facilities by the Owner as outlined in Paragraph 6.13.

d. Liability for liquidated damages incurred by Contractor as set forth in the Agreement.

E. Prompt Payment Clause

1. Owner and Contractor agree that all partial payments and final payments shall be subject to the Georgia Prompt Pay Act, as originally enacted and amended, and as set forth in O.C.G.A. 13-11-1 through 13-11-11, except as provided below to the extent authorized by law.

2. Interest Rate: For purposes of computing interest on late payments, the rate of interest shall be the applicable monthly interest rate for the "Georgia Fund 1" investment pool managed by the State of Georgia Office of Treasury and Fiscal Services. ~~one-half percent per month or a pro rata fraction thereof on the unpaid balance as may be due.~~

3. Payment Periods:

a. When Contractor has performed in accordance with the provisions of these Contract Documents, the Owner shall pay Contractor within 45 days of receipt by the Owner or the Owner's representative of any properly completed Application for Payment, based upon work completed or service provided pursuant to the terms of these Contract Documents.

b. When a subcontractor has performed in accordance with the provisions of its subcontract and the subcontract conditions precedent to payment have been satisfied, Contractor shall pay to that subcontractor and each subcontractor shall pay to its subcontractor, within ten days of receipt by Contractor or subcontractor of each periodic or final payment, the full

amount received for such subcontractors work and materials based on work completed or service provided under the subcontract, less retainage expressed as a percentage, but such retainage shall not exceed that retainage being held by the Owner, provided that the subcontractor has provided or provides such satisfactory reasonable assurances of continued performance and financial responsibility to complete its work as contractor in its reasonable discretion may require, including but not limited to a payment and performance bond.

4. Interest on Late Payment: Except otherwise provided in these Contract Documents and/or in O.C.G.A. 13-11-5, if a periodic or final payment to Contractor is delayed by more than the time allotted in Paragraph 14.02.E.3b, or if a periodic or final payment to a subcontractor is delayed more than ten days after receipt of periodic or final payment by Contractor or Subcontractor, the Owner, Contractor, or subcontractor, as the case may be, shall pay interest to its Contractor, or subcontractor beginning on the day following the due dates as provided in Paragraph 14.02.E.3b, at the rate of interest as provided herein. Interest shall be computed per month or a pro-rata fraction thereof on the unpaid balance. There shall be no compounded interest. No interest is due unless the person or entity being charged interest received "Notice" as provided in Paragraph 14.02.E.5. Acceptance or progress payments or final payment shall release all claims for interest on said payments.

5. Notice of Late Payment and Request of Interest: Any person or entity asserting entitlement to interest on any periodic or final payment pursuant to the provisions of this Prompt Payment Clause shall provide "notice" to the person or entity being charged interest of the charging party's claim to interest on late payment. "Notice" shall be in writing, served by U.S. Certified Mail – Return Receipt Requested at the time the properly completed Application for Payment is received by the Owner or Owner's representative, and shall set forth the following:
 - a. A short and concise statement that interest is due pursuant to the provisions of the Georgia Prompt Pay Act and this Prompt Payment Clause;

 - b. The principal amount of the periodic or final payment which is allegedly due to the charging party; and

 - c. The first day and date upon which the charging party alleges that said interest will begin to accrue, pursuant to the provisions of the Georgia Prompt Pay Act and this Prompt Payment Clause.

6. These "Notice" provisions are of the essence; therefore, failure to comply with any requirement as set forth in the Prompt Payment Clause precludes the right to interest on any alleged late payment to which said "Notice" would otherwise apply.

7. Integration with the Georgia Prompt Pay Act: Unless otherwise provided in these Contract Documents, the parties hereto agree that these provisions of this Prompt Payment Clause supersede and control all provisions of the Georgia Prompt Pay Act (O.C.G.A. 13-11-1

through 13-11-11 (1994)), as originally enacted and as amended, and that any dispute arising between the parties hereto as to whether or not the provisions of this contract or the Georgia Prompt Pay Act control will be resolved in favor of these Contract Documents and its terms.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.
- B. No materials or supplies for the Work shall be purchased by Contractor or subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.
- C. Contractor shall indemnify and save Owner harmless from all claims growing out of the lawful demands for payment by subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. Contractor shall, at Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If Contractor fails to do so, then Owner may, after having served written notice on the said Contractor either pay unpaid bills, of which Owner has written notice, direct, or withhold from Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to Contractor shall be resumed, in accordance with the terms of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon Owner to either Contractor or to Contractor's Surety. In paying any unpaid bills of Contractor, Owner shall be deemed the agent of Contractor and any payment so made by Owner shall be considered as payment made under the Contract by Owner to Contractor and Owner shall not be liable to Contractor for any such payment made in good faith.

14.04 *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 (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion. Specific items of Work that must be completed prior to the Engineer's issuance of a certificate of Substantial Completion include, but are not limited to, the following:
 - 1. Correction of all deficient Work items listed by all state, local, and other regulatory agencies or departments.
 - 2. All submittals must be received and approved by the Engineer, including but not necessarily limited to, the following:
 - a. Record documents.

- b. Factory test reports, where required.
 - c. Equipment and structure test reports.
 - d. Manufacturer's Certificate of Proper Installation.
 - e. Operating and maintenance information, instructions, manuals, documents, drawings, diagrams, and records.
 - f. Spare parts lists.
3. All additional warranty or insurance coverage requirements have been provided.
 4. All manufacturer/vendor-provided operator training is complete and documented.
 5. All occupancy permits required by local building code officials.
 6. Other items of Work specified elsewhere as being prerequisite for Substantial Completion.
- 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 tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

- E. 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 tentative list.

14.05 *Partial Utilization*

- 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. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and 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 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and 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 14.04 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 5.10 regarding property insurance.

14.06 *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 is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *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, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments. Under no circumstances will Contractor's application for final payment be accepted by the Engineer until all Work required by the Contract Documents has been completed.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, ~~if any~~, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
 - e. The Contractor's signed and sealed final change order to close the Contract; and
 - f. Any other data reasonably required by the Owner and/or Engineer, including execution of Affidavit of Contractor, establishing payment or satisfaction of all obligations, including releases, waivers of liens, and documents of satisfaction of debts.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) 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.

B. Engineer's Review of Application and Acceptance:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying all documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, ~~within ten days after receipt of the final Application for Payment,~~ indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. ~~At the same time~~ Thereupon Engineer will ~~also~~ give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. 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. If the Application for Payment and accompanying documentation are appropriate as to form and substance, Owner will in accordance with the applicable State or local General Law, pay Contractor the amount recommended by Engineer.

C. *Payment Becomes Due:*

1. ~~Thirty-Sixty~~ days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner ~~other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.~~

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *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 notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the

Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will 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 established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor's repeated disregard of the authority of Engineer; ~~or~~
4. Contractor's violation in any substantial way of any provisions of the Contract Documents;
5. If Contractor abandons the Work, or sublets this Contract or any part thereof, without the previous written consent of Owner, or if the Contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified;
6. Contractor is adjudged bankrupt or insolvent;
7. Contractor makes a general assignment for the benefit of creditors;
8. A trustee or receiver is appointed for Contractor or for any of Contractor's property;
9. Contractor files a petition to take advantage of any debtor's relief act, or to reorganize under the bankruptcy or applicable laws;
10. Contractor repeatedly fails to supply sufficient skilled workmen, materials or equipment;
11. Contractor fails to make satisfactory progress toward timely completion of the work; or
12. Contractor repeatedly fails to make prompt payments to subcontractors or material suppliers for labor, materials or equipment.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor; unless Contractor otherwise cures the deficiency in accordance with Paragraph 15.02.D.:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. 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
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.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 all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. 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.
- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.
- G. Any termination by Owner pursuant to Paragraph 15.02 may result in the disqualification of Contractor for bidding on future contracts of Owner.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate or discontinue, in whole or in part, 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. direct 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;~~
 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; ~~and~~
 4. reasonable expenses directly attributable to termination; ~~and-~~
 5. ten percent overhead and profit for those costs agreed to in Paragraphs 15.03.A.1 through 15.03.A.4 above.
- B. Contractor shall submit within 30 calendar days after receipt of notice of termination a written statement setting forth its proposal for an adjustment to the Contract Price to include only the incurred costs described in this clause. Owner shall review, analyze, and verify such proposal and negotiate an equitable amount and the Contract may be modified accordingly.
- C. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within ~~30~~45 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.
- 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, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 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 16 – DISPUTE RESOLUTION

~~16.01 Methods and Procedures~~

- ~~A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.~~
- ~~B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.~~
- ~~C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:~~
- ~~1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or~~
 - ~~2. agrees with the other party to submit the Claim to another dispute resolution process; or~~
 - ~~3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.~~

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, or by facsimile transmission and followed by written confirmation, to the last business address known to the giver of the notice.
- B. All notices required of Contractor shall be performed in writing to the appropriate entity.
- C. Electronic mail and messages will not be recognized as a written notice.

D. If the Contractor does not immediately notify the Owner in writing of the belief that a field order, additional work by other contractors or the Owner, or subsurface, latent, or unusual unknown conditions entitles the Contractor to a Change Order, no consideration for time or money will be given the Contractor.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents 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.

17.03 *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 Documents. 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.

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

A. ~~This Contract is to be governed by the law of the state in which the Project is located.~~ Each and every provision of this Agreement shall be construed in accordance with and governed by Georgia law. The parties acknowledge that this Contract is executed in Cobb County, Georgia and that the Contract is to be performed in Cobb County, Georgia. Each party hereby consents to the Cobb County Superior Court's sole jurisdiction over any dispute which arises as a result of the execution or performance of this Agreement, and each party hereby waives any and all objections to venue in the Cobb County Superior Court.

17.06 *Headings*

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

17.07 Addresses

A. Both the address given in the Bid form upon which this Agreement is founded, and Contractor's office at or near the site of the Work are hereby designated as places to either of which notices, letters, and other communications to Contractor shall be certified, mailed, or delivered. The delivering at the above named place, or depositing in a postpaid wrapper directed to the first-named place, in any post office box regularly maintained by the post office department, of any notice, letter or other communication to Contractor shall be deemed sufficient service thereof upon date of such delivery or mailing. The first-named address may be changed at any time by an instrument in writing, executed by Contractor, and delivered to and acknowledged by the Owner and Engineer. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter, or other communication upon Contractor personally.

17.08 Forms and Record

- A. The form of all Submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the Engineer.
- B. Contractor shall maintain throughout the term of the Contract, complete and accurate records of all Contractor's costs which relate to the work performed, including the extra work, under the terms of the Contract. The Owner, or its authorized representative, shall have the right at any reasonable time to examine and audit the original records.
- C. Records to be maintained and retained by Contractor shall include, but not be limited to:
1. Payroll records accounting for total time distribution of Contractor's employees working full or part time on the work;
 2. Cancelled payroll checks or signed receipts for payroll payments in cash;
 3. Invoices for purchases, receiving and issuing documents, and all other unit inventory records for Contractor's stores, stock, or capital items;
 4. Paid invoices and cancelled checks for materials purchase, subcontractors, and any other third parties' charges;
 5. Original estimate and change order estimate files and detailed worksheets;
 6. All project-related correspondence; and
 7. Subcontractor and supplier change order files (including detailed documentation covering negotiated settlements).

D. Owner shall also have the right to audit: any other supporting evidence necessary to substantiate charges related to this agreement (both direct and indirect costs, including overhead allocations as they may apply to costs associated with this agreement); and any records necessary to permit evaluation and verification of Contractor compliance with contract requirements and compliance with provisions for pricing change orders, payments, or claims submitted by Contractor or any payees thereof. Contractor shall also be required to include the right to audit provision in the contracts (including those of a lump-sum nature) of all subcontractors, insurance agents, or any other business entity providing goods and services.

17.09 Assignment

A. Contractor shall not assign the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the Owner. In case Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to Contractor shall be subject to prior liens of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for under this Contract.

END OF SECTION

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition, with CCMWA Modifications 01-13-2010). All provisions which are not so amended or supplemented remain in full force and effect.

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

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

The provisions in this Section of the Specifications shall govern in the event of any conflict between this Section and the General Conditions.

SC-2.02.B.1 Add the following new paragraph immediately after 2.02.B of the General Conditions

1. To receive electronic copies of the Contract Documents, Contractor shall complete and provide to Engineer an Electronic Media Release Form.

SC-4.02 *Subsurface and Physical Conditions*

SC-4.02.C Add the following new paragraph immediately after 4.02.B:

4.02.C In preparation of Drawings or Specifications, Engineer or Related Entities relied on the following reports or explorations and tests of subsurface conditions at the Site:

4.02.C.1 Report dated March 8, 2019, prepared by Geo-Hydro Engineers, Inc. of Subsurface Exploration, New 6 Million-Gallon Clearwell, Hugh A. Wyckoff Water Treatment Plant Acworth, Georgia, Geo-Hydro Project Number 181244.20.

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

4.02.D.1 Hugh A. Wyckoff Water Treatment Plant, Filter Building Rehabilitation and Electrical Improvements, CCMWA Project 505-9005-00-61-0000, dated June 2015, by CH2MHill.

4.02.D.2 Hugh A. Wyckoff Water Treatment Plant, Regulatory and Operational Improvements, CCMWA Project 27401, Record Drawings dated February 2015, by CH2MHill.

4.02.D.3 Allatoona Water Treatment Plant, CCMWA Drawer 5-1, dated July 1964, by Hensley-Schmidt, Inc.

4.02.D.4 Allatoona Water Treatment Plant, dated March 1971, by Hensley-Schmidt, Inc.

4.02.D.5 Hugh A. Wyckoff Water Treatment Plant Upgrade Contract No. 24, dated August 1984, by Hensley-Schmidt, Inc.

4.02.E. Copies of reports itemized in SC 4.02.C that are not included with Bidding Documents may be examined at the office of the Engineer during regular business hours. These reports are not part of the Contract Documents, but the "technical data" contained therein are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Engineer and Related Entities in the preparation of Drawings and Specifications.

SC-5.02 *Licensed Sureties and Insurers*

SC-5.02.B Add a new paragraph immediately after Paragraph 5.02.A of the General Conditions which is to read as follows:

- B. All Sureties and Insurers must have an A.M. Best Financial Strength Rating of A- or higher, with a Financial Size Category of X or higher.

SC-5.03 *Certificates of Insurance*

SC-5.03 The following shall be added as 5.03.F thru N, following 5.03.E:

- F. Notwithstanding provisions of O.C.G.A., Section 33-23-44, insurance certificate must include the following affirmative statement: "Coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty (30) days prior written notice has been given to Owner and to each other additional insured to whom a certificate of insurance has been issued."
- G. Insurance certificate must show proper name and address of Cobb County-Marietta Water Authority: 1170 Atlanta Industrial Drive, Marietta, Georgia 30066 and show Owner, Engineer, and Engineer's Consultants as additional insureds.
- H. Insurance certificate must show coverage applies for contractual liability for Contractor's indemnity obligations under Paragraphs 6.07, 6.11 and 6.20 of the General Conditions.
- I. In addition to the requirement for the policy limits specified under S.C. 5.04, A.3 – A.5, the applicable insurance certificate must show that the entire aggregate policy limits for general liability coverage will apply specifically for the Project.
- J. Each insurance certificate for coverage other than Worker's Compensation Insurance must show that a waiver of rights of recovery against any of the insureds or the additional insureds is in effect.

- K. Certificate for Contractor's liability insurance must show coverage of claims for damages because of bodily injury, sickness or death of any person or property damage resulting from the ownership, maintenance or use of mobile equipment.
- L. Certificate for Worker's Compensation Insurance must show coverage includes executive officers and Contractor's leased employees, temporary staff and part-time employees.
- M. Owner may waive specific insurance coverages set forth in SC-5.04 where contractor provides equivalent insurance coverage by way of a different combination of policies.
- N. Each insurance certificate must show coverage is underwritten with an insurance carrier which has A.M. Best ratings as stipulated in Paragraph SC-5.02-B.

SC-5.04 *Contractor's Liability Insurance*

The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide the following coverages for not less than the following limits or greater where required by Laws and Regulations:

5.04.A.1 and 5.04.A.2 For coverage as required by General Conditions 5.04.A.1 and 5.04.A.2 (Worker's Compensation):

- | | |
|--------------------------|-----------------|
| (1) State | Statutory Limit |
| (2) Federal | Statutory Limit |
| (3) Employer's Liability | \$ 1,000,000 |

5.04.A.3 – A.5 For coverage as required by General Conditions 5.04.A.3, 5.04.A.4 and 5.04.A.5 (General Liability) which shall also include broad form property damage liability, loss of use of tangible property, and loss of use of property that has not been damaged but has been rendered useless nonetheless, completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of CONTRACTOR other than Contractor's work or equipment:

- | | |
|--|--------------|
| (1) Aggregate | \$ 2,000,000 |
| (2) Each Occurrence | \$ 1,000,000 |
| (3) Products and completed operations, aggregate | \$ 2,000,000 |
| (4) Personal and advertising injury | \$ 1,000,000 |
| (5) Fire Damage/Legal Liability | \$ 100,000 |
| (6) Medical Expense Limit any one person | \$ 5,000 |
| (7) Property damage liability insurance will provide explosion, collapse and underground coverages where applicable. | |
| (8) Excess/Umbrella Liability: | |
| General Aggregate | \$ 5,000,000 |
| Each Occurrence | \$ 5,000,000 |

The aggregate policy limits for general liability coverage must be designated to the Project. The excess/umbrella policy must provide additional coverage for policy limits in excess of the general liability (including products and completed operations), automobile liability, contractual liability and employer's liability. Mobile equipment coverage described in S.C. 5.03.G must be included.

5.04.A.6 Automobile Liability:

(1) Combined Single Limit (Bodily Injury and Property Damage): \$ 1,000,000

Coverage must be provided for all owned/leased, hired and non-owned vehicles.

5.04.B.3. *Contractual Liability Insurance:*

The Contractual Liability coverage required by paragraph 5.04.B.3 of the General Conditions shall provide coverage for not less than the following amounts:

(1) General Aggregate \$ 2,000,000

(2) Each Occurrence (Bodily Injury and Property Damage) \$ 2,000,000

The aggregate policy limits for Contractual Liability must be designated to the Project. As indicated in S.C. 5.04.A.3 – A.5, the excess/umbrella policy must provide additional coverage in excess of these amounts.

SC-5.04.E After Paragraph D. add Paragraph 5.04.E:

- E. Additional Insureds: The Owner, Engineer, and Engineer's Consultant shall be covered as Additional Insured under any and all Insurance required by this Contract, and such insurance shall be primary with respect to the Additional Named Insured. Confirmation of this shall appear on the Accord Certificate of Insurance, and on any and all applicable Insurance policies. However, this requirement does not apply to Workers' Compensation or Professional Liability Insurance. Copies of endorsements showing that the Owner and each additional insured identified herein have been added to the policies as an additional insured shall be attached to each of the certificates.

SC-5.06 *Property Insurance*

Delete Paragraph 5.06 of the General Conditions in its entirety and insert the following in its place:

5.06.A. Contractor shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof except for flood perils which shall have a \$1,000,000 limit (subject to such deductible amounts as may be provided in these Supplemental Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants and any other person or entities identified in the Supplementary Conditions,

each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk or Installation Floater "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework and Work in transit and shall insure real and personal property against at least the following perils: fire, lightning, extended coverage, theft, vandalism and malicious mischief, explosives and blasting, wind, flood, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions;
3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects, permits, loss and damage to the Work, temporary building and scaffoldings, false work, work in transit, and materials and supplies, fixtures, machinery and equipment);
4. cover materials and equipment in transit for incorporation in the Work or stored at the site or at any other location prior to being incorporated in the Work, provided that such materials and equipment have been recommended by Engineer; and be maintained in effect until final agreed to in writing by Owner, Contractor, and Engineer with thirty days' written notice to each other additional insured to whom a certificate of insurance has been issued;
5. allow for partial utilization of the Work by Owner;
6. include testing and startup;
7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued;
8. contain the following provisions: (1) coverage for property in transit and (2) coverage for building damage as required by ordinance and law including demolition, debris removal and increased cost of construction; and
9. property insurance furnished under this contract shall have deductibles no greater than \$25,000 for all perils.

5.06.B. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions or approved by Owner. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

The policies of insurance required to be purchased and maintained by Contractor in accordance this paragraph 5.06 shall comply with the requirements of GC 5.04.B.5.

SC-6.02 *Labor; Working Hours*

SC-6.02 Add the following subparagraph 6.02.D.1:

1. The rate of \$135.00/hour will apply for the overtime work performed on behalf of the Owner or Engineer.

SC-6.08 *Permits*

SC-6.08.B Add the following subparagraph 6.08.B

- B. The Owner will submit Contract Drawings and Specifications to Cobb County Community Development.

SC-6.13 *Safety and Protection*

SC-6.13 Following Paragraph 6.13.G, add the following:

H. Contractor's Plan for Safety Precautions and Programs

1. Before any Work at the site is started, Contractor shall have prepared Contractor's written plan for Project-specific safety precautions and programs, complete with respect to procedures and actions that the Contractor intends Contractor and all others as provided in Paragraphs 6.13.A.1 and 13.02.A, to follow in order for Contractor and all others to comply with all applicable Laws and Regulations. Contractor's plan for safety precautions and programs shall have been approved and endorsed by Contractor's designated safety representative required in Paragraph 6.14.A.
2. Contractor shall revise Contractor's plan for safety precautions and programs at appropriate times to reflect changes in construction conditions, the Work, Contractor's means, methods, techniques, sequences and procedures of construction, and the requirements of paragraph 13.02.A. Contractor shall disseminate the original plan and revisions to all others indicated in Paragraphs 6.13.A and 13.02.A.
3. Contractor's plan for safety precautions and programs will not require more stringent safety requirements, training or other qualifications for all others, including those specified in Paragraph 13.02.A and their employees, than Contractor sets forth for comparable activity and responsibility of Contractor, Subcontractors, and Suppliers and their respective employees.

SC-9.03 *Project Representative*

SC-9.03 Add the following new paragraphs immediately after Paragraph 9.03.A:

- B. The Resident Project Representative (RPR) will be Engineer's or Engineer's Consultant's employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall be only through or with the full knowledge and approval of Contractor. The RPR shall:
1. *Schedules*: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by Contractor and consult with Engineer concerning acceptability.
 2. *Conferences and Meetings*: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.
 3. *Liaison*:
 - a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, assist in providing information regarding the intent of the Contract Documents.
 - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
 - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.
 4. *Interpretation of Contract Documents*: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
 5. *Modifications*: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
 6. *Review of Work and Rejection of Defective Work*:
 - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
 - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress will not produce a completed Project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress

that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

7. *Inspections, Tests, and System Startups:*

- a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
- b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

8. *Records:*

- a. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
- b. Maintain records for use in preparing Project documentation.
- c. Obtain GPS locations along center line of pipe at every joint of pipe, at fittings and other important locations. Contractor shall assist RPR in holding the GPS rover unit rod on top of the pipe as needed, wait for the GPS unit to obtain an accurate reading (for a reasonable time but not to exceed 15 minutes) and return the equipment to the RPR before safety shoring is removed.

9. *Reports:*

- a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.
- b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
- c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Hazardous Environmental Condition.

10. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

11. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
 12. *Completion:*
 - a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
 - b. Participate in a final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.
 - c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the Notice of Acceptability of the Work.
- C. Contractor is hereby advised by Engineer that the RPR is not authorized to:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
 2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.
 3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's superintendent.
 4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.
 5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
 6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
 7. Authorize Owner to occupy the Project in whole or in part.

SC-12.03 *Delays*

Add the following subparagraphs to Paragraph 12.03.C:

1. Extensions of time will be granted for abnormal inclement weather conditions that delay the critical path of the progress of the work.
2. Abnormal weather is defined as days lost to weather where precipitation exceeds 0.10-inches.
3. Contract Time will not be extended for normal bad weather. The Contract Time in the Contract Documents includes due allowance for calendar days on which work cannot be performed outdoors. For the purpose of this Contract, Contractor agrees that he may expect to lose a total number of calendar days between the Notice to Proceed date and the Substantial Completion date due to weather in accordance with the following table which is the average from three local area weather stations:

Month	Days
January	7
February	7
March	7
April	6
May	6
June	7
July	8
August	7
September	5
October	4
November	5
December	7

4. If the total accumulated (not on an individual month-by-month basis) number of calendar days (pro-rated for the Notice to Proceed date month and/or Substantial Completion date per the table above as may be applicable to reflect the actual dates of these occurrences) lost to weather from the Notice to Proceed date to the Substantial Completion date exceeds the total accumulated number to be expected for the same period from the table above, time for completion will be extended by the number of calendar days needed to include the excess number of calendar days lost. The contractor shall submit with each pay request a letter stating the number of days lost for the respective pay period so that it may be agreed upon by all parties.
5. No reduction in Contract Time shall be imposed if the total days actually lost to weather is less than the total to have been expected for that same period.

END OF SECTION

SECTION 00 20 00

APPROVED SUPPLIERS OF SERVICES

PART 1 – GENERAL

1.01 SCOPE

This section outlines the approved suppliers of services (vendors and subcontractors) for the Project.

1.02 PRE-APPROVED SUPPLIERS OF SERVICES

Electrical Subcontractors: The pre-approved electrical subcontractors include the following firms (listed alphabetically):

Cleveland Electric Company
1281 Fulton Industrial Blvd.
Atlanta, Georgia 30336
(404) 505-4428

Crowder Construction Company
1111 Burma Drive
Apex, NC 27539
(919) 367-2000

Excel Electrical Technologies, Inc.
1990 Vaughn Road, Suite 320
Kennesaw, GA 30144
(770) 514-0755

Instrumentation and Controls System Integrators/SCADA Improvements: The pre-approved Instrumentation and Controls System Integrators include the following firm:

MR Systems, Inc.
1185 Beaver Ruin Road, Suite A
Norcross, GA 30093
(678) 325-2800

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 SCOPE

- A. The Work to be done under these Contracts and in accordance with these Specifications consists of furnishing all equipment, superintendence, labor, skill, material and all other items necessary for the construction of the

Cobb County-Marietta Water Authority
Wyckoff WTP Clearwell #3

The Contractor shall perform all work required for such construction in accordance with the Contract Documents and subject to the terms and conditions of the Contract, complete and ready for use.

- B. The Project consists of construction of a new 6-million-gallon cast-in-place concrete tank and associated 84-inch steel piping. The principal features of the Work to be performed under this Contract include, but are not limited to:
1. Mass excavation and disposal off-site.
 2. Site dewatering and installation of rock anchors.
 3. Construction of new cast-in-place concrete tank with approximate dimensions of 140 feet wide x 300 feet long and cast-in-place concrete baffles. Tank roof to be either cast-in-place concrete or precast concrete with 6" concrete topping.
 4. Replacement of a section of existing 54" ductile iron pipe with 84" steel pipe and addition of 84" steel pipe with 84" butterfly valves.
 5. Connection of 84" steel pipe to two existing concrete clearwells.
 6. Electrical and SCADA modifications to integrate new instruments into existing facilities.
 7. Disinfection and startup.
- C. The foregoing description(s) shall not be construed as a complete description of all work required.

1.02 CONTRACT DOCUMENTS

- A. Reference Section 00 52 00, Agreement Between Owner and Contractor, Article 8, Contract Documents for definition of Contract Documents.
- B. The Work to be performed is shown on the set of Drawings entitled Wyckoff WTP Clearwell #3 dated May 2020. The number and titles of all Drawings appear on the cover sheet of

the Drawings. All drawings so enumerated shall be considered an integral part of the Contract Documents as defined herein.

- C. Certain Document Sections refer to Divisions of the Contract Specifications. Sections are each individually numbered portions of the Specifications (numerically) such as 01 00 00, 05 50 00, 16 00 00, etc. The term Division is used as a convenience term meaning all Sections within a numerical grouping. Division 16 would thus include Sections 16 00 00 through 16 99 99.
- D. Where references in the Contract Documents are made to Contractors for specific disciplines of work (i.e., Electrical Contractor, etc.), these references shall be interpreted to be the single prime Contractor.

1.03 GENERAL ARRANGEMENT

- A. Drawings indicate the extent and general arrangement of the work. If any departures from the Drawings are deemed necessary by the Contractor to accommodate the materials and equipment he proposes to furnish, details of such departures and reasons therefore shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer. Approved changes shall be made without additional cost to the Owner for this work or related work under other Contracts of the Project.
- B. The specific equipment proposed for use by the Contractor on the project may require changes, in structures, auxiliary equipment, piping, electrical, mechanical, controls or other work to provide a complete satisfactory operating installation. The Contractor shall submit to the Engineer, for approval, all necessary Drawings and details showing such changes to verify conformance with the overall project structural and architectural requirements and overall project operating performance. The Bid Price shall include all costs in connection with the preparation of new drawings and details and all changes to construction work to accommodate the proposed equipment, including increases in the costs of other Contracts.

1.04 PERIODIC CLEANUP: BASIC SITE RESTORATION

- A. During construction, the Contractor shall regularly remove from the site of the work all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the Contractor's yard or base of operations for the Project.
- B. Upon failure of the Contractor to perform periodic cleanup and basic restoration of the site to the Engineer's satisfaction, the Owner may, upon five (5) days prior written notice to the Contractor, without prejudice to any other rights or remedies of the Owner, cause such work for which the Contractor is responsible to be accomplished to the extent deemed necessary by the Engineer, and all costs resulting therefrom shall be charged to the Contractor and deducted from the amounts of money that may be due him.

1.05 PRE-CONSTRUCTION VIDEO

- A. Prior to the start of construction activities, the Contractor shall video the project site including any structures to be demolished and existing structures that are to be modified. The original video image shall be turned over to the Engineer prior to beginning construction activities. The video shall be provided as an Audio Video Interleave File (.avi)

and shall be provided on USB flash drives. The video shall clearly identify existing site and structural conditions prior to construction.

1.06 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Prior to the start of construction activities, digital photographs shall be taken of key areas of the site to complement the pre-construction video and provide additional detail as may be necessary to document the existing condition of the site prior to Construction. The photographs shall be date stamped, 8.0 megapixel or greater, and provided on USB flash drives. The photographs shall be clearly labeled with file names using the following format: Date picture taken, subject, and orientation of view, i.e., 2020.08.01(Post Mix 54" Piping).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 21 00

ALLOWANCES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Contractor shall include in his bid the allowances listed in the bid proposal. These allowances shall cover work, manufactured equipment or services that will be provided either by the Contractor or by others who may be selected by the Owner. All work performed under allowances shall be subject to Owner approval and under special terms described herein. The contractor shall coordinate and cause the work covered by these allowances to be performed. Payment for Allowances shall be administered in accordance with the Contract General Conditions, Paragraph 11.02.

- B. Cash Allowances for Purchases and Purchased Services: Where Contractor purchases equipment or materials that are authorized to be paid from Allowances and installed or incorporated into the project, the Contractor's costs for unloading, storage, handling, installation, overhead, profit, and all other expenses are to be included in Contractor's Lump Sum Work price (Item 1 of the Bid Form). This same provision will apply to Purchased Services by Owner from parties who are not a subcontractor to the Contractor. Cash Allowances shall be paid at the actual price shown on the invoice from the provider or supplier with no additional cost to the Owner.

PART 2 – SCHEDULE OF ALLOWANCES

2.01 ALLOWANCE FOR OWNER-DIRECTED WORK

- A. The purpose for this allowance is to reimburse the Contractor for contingency and work as directed by the Owner. In order to be eligible for payment under this item, the Contractor must submit a written proposal to the Owner for approval before any work begins. Reimbursement to the Contractor will be paid in accordance with the Contract General Conditions, Paragraph 11.01, Cost of the Work.

2.02 CASH ALLOWANCES

- A. The following allowances are to be administered as Cash Allowances and will be paid at the actual cost to the Contractor, as evidenced by copy of the invoice submitted by the supplier or provider. Sales and use taxes are included in the Cash Allowance and no other costs or expenses shall be paid for.

Cash Allowance for Testing and Special Inspections (other than provided by Engineer)	\$250,000.00
Cash Allowance for Construction Surveying for Engineer's Use Only	\$15,000.00
Cash Allowance for Additional Electronic Equipment for Engineer's Trailer Not Listed in Specifications	\$15,000.00

Cash Allowance for Landscaping (other than Grassing included in Base Bid Price)	\$50,000.00
Cash Allowance for Owner's/Engineer's Travel Expenses to Attend Butterfly Valve and Steel Pipe Witness Tests	\$10,000.00

- END OF SECTION -

SECTION 01 29 76

PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

- 1.01 Submit applications for payment to the engineer in accordance with the schedule established by general conditions of the contract and the agreement between owner and contractor.
- 1.02 RELATED REQUIREMENTS IN OTHER PARTS OF THE PROJECT MANUAL:
 - A. Lump Sum and Unit Prices: Agreement between Owner and Contractor.
 - B. Progress payments, retainages and final payment: General Conditions of the Contract.
- 1.03 RELATED REQUIREMENTS SPECIFIED IN OTHER SECTIONS:
 - A. Closeout Submittals: Section 01 78 00.

PART 2 – FORMAT AND DATA REQUIRED

- 2.01 Submit applications on a form approved by engineer, with itemized data typed in proper format.
- 2.02 Contractor shall submit cash flow projections with each application for payment, in Microsoft Excel format. The projection shall show estimated billing from the time the pay application is submitted through project completion.

PART 3 – SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- 3.01 When the owner or the engineer requires substantiating data, contractor shall submit suitable information, with a cover letter identifying:
 - A. Project.
 - B. Application number and date.
 - C. Detailed list of enclosures or attachments.
 - D. For stored products:
 - 1. Item number and identification as shown on application.
 - 2. Description of specific material.
 - E. Dry tickets for materials paid by ticket.

- F. Copy of Contractor's field notes showing as-built information of the water main.
 - G. Submit one copy of data and cover letter for each copy of application.
- 3.02 Submit application for payment to the engineer at the times stipulated in the agreement.
- A. Format and Delivery: One copy in electronic Portable Document Format (PDF), by email.
 - B. When the Engineer finds the application properly completed and correct, he will transmit a recommendation for payment to Owner, with a copy to Contractor.

- END OF SECTION -

SECTION 01 31 13

PROJECT COORDINATION

PART 1 – GENERAL

1.01 SCOPE

- A. The Contractor shall allow the Owner or his agents, and other project Contractors or their agents, to enter upon the work for the purpose of constructing, operating, maintaining, removing, repairing, altering, or replacing such pipes, sewers, conduits, manholes, wires, poles, or other structures and appliances which may be required to be installed at or in the work. The Contractor shall cooperate with all aforesaid parties and shall allow reasonable provisions for the prosecution of any other work by the Owner, or others, to be done in connection with his work, or in connection with normal use of the facilities.
- B. The Contractor shall cooperate fully with the Owner, the Engineer, and all other Contractors employed on the work, to effect proper coordination and progress to complete the project on schedule and in proper sequence. Insofar as possible, decisions of all kinds required from the Engineer shall be anticipated by the Contractor to provide ample time for inspection, or the preparation of instructions.
- C. Periodic coordinating conferences shall be held per Section 01 31 19, Project Meetings, of these Contract Documents.
- D. Security for access to the Wyckoff Water Treatment Plant shall follow the procedures and requirements of Section 01 35 53, Job Site Security, of these Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

- A. The information included in this and other sections of these Contract Documents regarding sequencing is provided to assist Contractor in developing a construction sequencing plan. Contractor shall be solely responsible for all construction sequencing.
- B. General sequencing guidelines are as follows:
 - 1. The new clearwell to be constructed first. Before the new clearwell can be put in operation, it must be tested for leaks. This will require the 84" steel piping to be constructed and connected to it.
 - 2. Connection to existing 60" High Service Pump Station intake manifold can be made by isolating one or two high service pumps without shutting the plant down.
 - 3. Removal and replacement of the 54" bypass line around Clearwell #2 may be made without draining Clearwell #2, however, this clearwell can be drained after the new Clearwell #3 is in service and operational.
 - 4. Connection of 84" piping to Clearwell #2 can be made after this tank is drained.

5. Replacement of 54" pipe at Clearwell #1 with 84" piping can be made after this tank is drained.

- END OF SECTION -

SECTION 01 31 19
PROJECT MEETINGS

PART 1 – GENERAL

1.01 PRE-BID MEETING

- A. A pre-bid meeting will be held at the time and place to be designated in the Instructions to Bidders.
- B. The Engineer will be available to discuss the project and answer pertinent questions. No oral interpretation will be made as to the meaning of the Documents. Interpretation, if deemed necessary by the Engineer, will be in the form of an Addendum to the Contract Documents.

1.02 PRE-CONSTRUCTION MEETING

- A. A pre-construction meeting will be held after Award of Contract, but prior to starting work at the site.
- B. Attendance:
 - 1. Owner.
 - 2. Engineer.
 - 3. Contractor, including major staff including project manager, superintendent, quality control coordinator, subcontractor coordinator, and vendor startup/commissioning coordinator.
 - 4. Contractor's major subcontractors.
 - 5. Contractor's safety representative.
 - 6. Representatives of governmental or other regulatory agencies.
- C. Minimum Agenda:
 - 1. 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. Weather delays.
7. Submittal of Shop Drawings and samples.
8. Procedures for maintaining record documents.
9. Processing of Partial Payment Requests (format, submittal cutoff date, pay date, retainage).
10. Use of site, including office and storage areas and Owner's requirements.
11. Major equipment deliveries and priorities.
12. Safety and first aid procedures.
13. Security procedures.
14. Housekeeping procedures.
15. Work hours.
16. General regard for community relations.

1.03 PROGRESS MEETINGS

- A. Progress meetings will be held monthly at Site during the performance of the work of this Contract. Additional meetings may be called as progress of work dictates.
- B. Engineer will preside at meetings and record minutes of proceedings and decisions. Engineer will distribute copies of minutes to participants.
- C. Attendance:
 1. Engineer.
 2. Contractor.
 3. Subcontractors, only with Engineer's approval or request, as pertinent to the agenda.
 4. Owner
- D. Minimum Agenda:
 1. Review and approve minutes of previous meetings.
 2. Review progress of Work since last meeting.
 3. Review proposed 30-60 day construction schedule.
 4. Note and identify problems which impede planned progress.

5. Develop corrective measures and procedures to regain planned schedule.
6. Revise construction schedule as indicated and plan progress during next work period.
7. Plant outages and coordination of critical activities.
8. Maintaining of quality and work standards.
9. Complete other current business.
10. Schedule next progress meeting.

1.04 PROCESS INSTRUMENTATION AND CONTROL SYSTEM (PICS) COORDINATION MEETINGS

- A. Engineer will schedule meetings at Site, conducted at a frequency as Work dictates to review specific requirements of PICS.
- B. Attendees will include:
 1. Contractor.
 2. Owner.
 3. PICS sub-contractor/installer.
 4. Engineer's representatives.

1.05 PRE-INSTALLATION MEETINGS

- A. When required in individual Specification sections, convene at Site prior to commencing the Work of that section.
- B. Require attendance of entities directly affecting, or affected by, the Work of that section.
- C. Notify Engineer at least four (4) working days in advance of meeting date.
- D. Provide suggested agenda to Engineer to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 32 16
CONSTRUCTION SCHEDULES

PART 1 – GENERAL

1.01 GENERAL

- A. Promptly after award of the contract, the Contractor shall prepare and submit to the Engineer estimated construction progress schedules for the Work, with sub-schedules of related activities which are essential to its progress.
- B. Submit revised progress schedules as necessary.
- C. Refer to Article 6.04 of the General Conditions, Progress Schedule, for other requirements.

PART 2 – PRODUCT

2.01 FORM OF SCHEDULES

- A. As determined by the Contractor and acceptable to the Engineer.

2.02 CONTENT OF SCHEDULES

- A. Construction Progress Schedule:
 - 1. Show the complete sequence of construction by activity.
 - 2. Show the dates for the beginning, and completion of, each major element of construction.
- B. Products Delivery Schedule Dates.
- C. Provide sub-schedules to define critical portions of prime schedules.
- D. Show float or slack (amount of time a task can be delayed without causing a delay).

2.03 PROGRESS REVISIONS

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedules:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission.

3. Revised projections of progress and completion.
 4. Other identifiable changes.
- C. Provide a narrative report as needed to define:
1. Problem areas, anticipated delays, and the impact on the schedule.
 2. Corrective action recommended, and its effect.

PART 3 – EXECUTION

3.01 SUBMISSIONS

- A. Submit initial schedules within 15 days after award of Contract.
1. The Engineer will review schedules and return review copy within 15 days after receipt.
 2. If required, resubmit within 7 days after return of review copy.
- B. Submit revised progress schedules with each application for payment.
- C. Submit one reproducible transparency and one opaque reproduction.

3.02 DISTRIBUTION

- A. Distribute copies of the reviewed schedules to:
1. Job site file.
 2. Subcontractors.
 3. Other concerned parties.
- B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

- END OF SECTION -

SECTION 01 33 00

SUBMITTALS

PART 1 – GENERAL

1.01 SCOPE

A. Progress Schedule

1. Submit Progress Schedule per General Conditions articles 2.05 B, 2.07, and 6.04 and per Section 01 32 16, Construction Schedule.

B. Schedule of Values

1. Submit Schedule of Values per General Conditions articles 2.05 B and 2.07, and 6.04 and per Section 01 32 16, Construction Schedule.

C. Working Drawings

1. Submit the preliminary Schedule of Submittals per General Conditions Article 2.05 B. If required and in accordance with General Conditions Article 2.07, the schedule shall be revised until it is approved by the Engineer.
2. Working Drawings include, but are not limited to, Shop Drawings, layout drawings in plan and elevation, installation drawings, elementary wiring diagrams, interconnecting wiring diagrams, manufacturer's data, etc. Contractor shall be responsible for securing all of the information, details, dimensions, weights, drawings, etc., necessary to prepare the Working Drawings required and necessary under this Contract and to fulfill all other requirements of his Contract. Contractor shall secure such information, details, Drawings, etc., from all possible sources including the Drawings, Working Drawings prepared by subcontractors, Engineers, suppliers, etc.
3. Working Drawings shall accurately and clearly present the following:
 - a. All working and installation dimensions.
 - b. Arrangement and sectional views.
 - c. Units of equipment in the proposed positions for installation, details of required attachments and connections, and dimensioned locations between units and in relation to the structures.
 - d. Necessary details and information for making connections between the various trades including, but not limited to, power supplies and interconnecting wiring between units, accessories, appurtenances, etc.

4. Working Drawings specifically prepared for this Project shall be on reproducible material sheets of the same size as the Drawings. Working Drawings shall conform to recognized drafting standards and be neat, legible and drawn to a large enough scale to show in detail the required information.
5. The Drawings are used for engineering and general arrangement purposes only and are not to be used for Working Drawings.

D. Shop Drawings

1. Submit the preliminary Schedule of Submittals per General Conditions Article 2.05 B. If required and in accordance with the General Conditions, the schedule shall be revised until it is approved by the Engineer.
2. Shop Drawings include, but are not limited to layout drawings in plan and elevation, installation drawings, elementary wiring diagrams, interconnecting wiring diagrams, manufacturer's data, etc. Contractor shall be responsible for securing all of the information, details, dimensions, Drawings, etc., necessary to prepare the Shop Drawings required and necessary under this Contract and to fulfill all other requirements of his Contract.
3. Shop Drawing Requirements
 - a. Contractor shall submit for review by the Engineer Shop Drawings for all fabricated work and for all manufactured items required to be furnished by the Contract Documents.
 - b. Structural and all other layout Drawings prepared specifically for the Project shall have a plan scale of not less than 1/4-inch = 1 foot.
 - c. Where manufacturer's publications in the form of catalogs, brochures, illustrations or other data sheets are submitted in lieu of prepared Shop Drawings, such submittals shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink, and submittals showing only general information are not acceptable.
 - d. Contractor shall prepare and submit for review by the Engineer layout and installation drawings for all pipes, valves, fittings, etc., under this Contract. The final dimensions, elevation, location, etc., of pipe, valves, fittings, etc., may depend upon the dimensions of equipment and valves to be furnished by the Contractor.
 - e. Layout and installation Drawings shall show connections to structures, equipment, sleeves, valves, fittings, etc.
 - f. Drawings shall show the location and type of all supports, hangers, foundations, etc., and the required clearances to operate valves, equipment, etc.
 - g. The Drawings for pipes, ducts, conduits, etc., shall show all 3-inch and larger electrical conduits and pressure piping, electrical cable trays,

heating and ventilation ducts or pipes, structure, manholes or any other feature within four (4) feet (measured as the clear dimension) from the pipe duct, conduit, etc., for which the profile is drawn.

4. Format for Shop Drawings:

- a. For shop drawings presented on sheets larger than 8 1/2-inches by 11 inches, include on each drawing the drawing title, number, date, and revision numbers and dates, in addition to the information required in the paragraph entitled "Identification of Submittals."
- b. For shop drawings presented on sheets 8 1/2-inches by 11 inches or less, conform to the format and quantity requirements for product data, and present as a part of the bound volume for the submittals required by the Section.
- c. Dimension drawings, except diagrams and schematic drawings; prepare dimensioned drawings to scale. Identify materials and products for work shown.
- d. Shop drawings shall be not less than 8 1/2 by 11 inches or more than 30 by 42 inches.
- e. Submit detailed drawings and descriptions of proposed deviations from details or component arrangement indicated on the drawings.
- f. Provide finished drawings for approval indicating proposed installation of Work, and materials and equipment being furnished.
- g. Copies of plans will not be accepted for submission as drawings, nor will catalog numbers alone of materials or equipment.
- h. Data shown on working drawings shall be sufficiently complete with respect to dimensions, design criteria, material of construction, and other details to enable review.
- i. **Shop Drawings shall be submitted by Contractor in Electronic format as follows:**
 - (1) Microsoft Windows compatible.
 - (2) Text in most current version of Microsoft Word (*.doc) or Adobe Acrobat (*.pdf) format, with searchable text.
 - (3) Drawings in Adobe Acrobat (*.pdf) format.
 - (4) Images or photographs in Adobe Acrobat, image files (*.jpg or *.gif format), or other Owner-approved format. Photographs or images shall be minimum 150 dpi resolution to provide sufficient clarity.

5. Contractor Responsibilities

- a. All submittals from subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for checking. Contractor shall thoroughly check all Drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors, manufacturers, or suppliers by the Contractor for correction before submitting them to the Engineer.
- b. All submittals shall be bound, dated, properly labeled and consecutively numbered. Information on the label shall indicate Specification Section, Drawing number, subcontractor's, manufacturer's or supplier's name and the name or type of item the submittal covers. Each part of a submittal shall be marked and tabulated.
- c. Shop Drawings shall be submitted as a single complete package for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system. Where applicable, the submittal shall include elementary wiring diagrams showing circuit functioning and necessary interconnection wiring diagrams for construction.
- d. Each submittal, or resubmittal, submitted by the Contractor shall have affixed to it the following Certification Statement, signed by the Contractor:

"Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved submittals and all Contract Requirements."

- e. All submittals shall be cross-referenced to the Owner's Asset Management system.
- f. If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal, and the departure clearly marked (i.e. circled, crossed out, etc.) on the submittal drawing or literature. Otherwise, the review of such submittals shall not constitute approval of the departure.
- g. No materials or equipment shall be ordered, fabricated, shipped or any work performed until the Engineer returns to the Contractor the submittals, herein required, annotated "Furnish as Submitted", "Furnish as Corrected", or "Furnish as Corrected – Confirm." If a submittal is returned "Furnish as Corrected – Confirm" the portions of work covered by the submittal that require confirmation by the Engineer shall not be ordered, fabricated, shipped, or any work performed until those portions are approved in a subsequent submittal either "Furnish as Submitted" or "Furnish as Corrected".

- h. **Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations, and/or omissions.**

6. Procedure for Review

- a. Submittals shall be transmitted in sufficient time to allow the Engineer at least thirty (30) days for review and processing.
- b. Where hard copies are required, Contractor shall transmit four (4) hard copies of all technical data or drawings to be reviewed. Each hard copy shall contain a USB flash drive with an electronic copy of the submittal contained in it.
- c. Submittal shall be accompanied by a letter of transmittal containing date, project title, Contractor's name, number and titles of submittals, a list of relevant specification sections, and notification of departures from any Contract requirement, and any other pertinent data to facilitate review.
- d. Submittals will be annotated by the Engineer in one of the following ways:
 - "No Exception Taken" (NET) – no exceptions are taken
 - "Furnish as Corrected" (FAC) – minor corrections are noted and shall be made.
 - "Revise and Resubmit" (R&R) – major corrections are noted and a full resubmittal is required.
 - "For Information Only - Not Reviewed" (FIO) – submittal was received and was distributed for record purposes without review.
- e. If a submittal is satisfactory to the Engineer in full or in part, the Engineer will annotate the submittal "No Exception Taken" or "Furnish as Corrected."
- f. If a full resubmittal is required, the Engineer will annotate the submittal "Revise and Resubmit" and transmit to the Contractor for appropriate action.
- g. Contractor shall continue to resubmit submittals in full if they are returned "Revise and Resubmit" as required by the Engineer until submittals are acceptable to the Engineer. It is understood by the Contractor that Owner may charge the Contractor the Engineer's charges for review in the event a submittal is not approved (either "No Exception Taken" or "Furnish as Corrected") by the fourth submittal for a system or piece of equipment. These charges shall be for all costs associated with engineering review, meetings with the Contractor or manufacturer, etc., commencing with the

fourth submittal of a system or type of equipment submitted for a particular Specification Section.

- h. Acceptance of a Shop Drawing by the Engineer will constitute acceptance of the subject matter for which the Drawing was submitted and not for any other structure, material, equipment or appurtenances indicated or shown.

7. Engineer's Review

- a. Engineer's review of the Contractor's submittals shall in no way relieve the Contractor of any of his responsibilities under the Contract. An acceptance of a submittal shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Drawings and Specifications.
- b. Engineer's review will be confined to general arrangement and compliance with the Contract Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fittings, tolerances, interferences, coordination of trades, etc.

8. Record Drawings

- a. On a daily basis, the Contractor shall maintain current record drawings onsite for the Engineer's review. Duplicate sets of record drawings shall be made by the Contractor using red pencil markups on full-size drawings that are stored in separate locations. Additional notes may be attached to each Drawing as needed to clearly identify as-built conditions of all process, electrical, instrumentation and controls, mechanical, structural, civil, and architectural components of the Project.
- b. With submission of each month's pay application, the Contractor shall provide updated Record Drawings to the Engineer reflecting as-built conditions current at the time of the pay application. The updates shall be made electronically in a format acceptable to the Engineer by the Contractor using layering and naming conventions provided by the Engineer. The final pay application shall include a complete set of Record Drawings, in both hard copy and AutoCAD, reflecting all work performed on the Project.
- c. All record drawing submittals shall comply with the provisions of this Section 01 33 00, Submittals.
- d. Prior to final payment, the Contractor shall furnish the Engineer one complete set of all accepted Shop Drawings, for equipment, piping, electrical work, instrumentation system, structural, interconnection wiring diagrams, stormwater control, etc. This shall be submitted in in both hard copy (organized and tabbed) and electronic (searchable and bookmarked PDF) formats in accordance with the provisions of this Section.

- e Shop Drawings furnished shall be corrected to include any departures from previously accepted Drawings.

9. Asset Registry

- a. In accordance with Section 01 61 13, Asset Registry, the Contractor shall generate the financial information necessary, including the cost of equipment without installation costs, to support the Owner's Fixed Asset Registry and submit the information on a monthly basis with each pay application, or more often as directed by the Engineer.

E. Operation and Maintenance Manuals

- 1. Refer to Section 01 78 23, Operation and Maintenance Manuals for specific operation and maintenance manual requirements.

F. Manufacturer's Warranty Log

- 1. Prior to final payment the Contractor shall provide the Owner with two copies of all manufacturers' warranties. The warranties shall be indexed in a three-ring binder. The index shall include each warranty's effective date. Warranties shall also be provided in electronic Portable Document Format (PDF).
- 2. Contractor shall provide the Owner with all Contractors' warranties for specified Work. The warranties shall be issued for no less than 12 months from the date of final completion unless otherwise specified.
- 3. Warranty start and end dates shall be included in the Asset Registry.

G. Record Documents

- 1. Contractor shall maintain a set of Contract Drawings in clean undamaged condition, with markup of actual installation that vary from the work originally shown. Show the as-built condition fully and accurately. Mark up new information that is recognized to be of importance but was not for some reason shown on either the Contract drawings or Shop Drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date. Note related change order number where applicable. Record Drawings must be confirmed by an actual field survey and sealed by a registered, responsible surveyor. The record drawings shall be maintained at the project site and will be available at any time for the Owner/Engineer's review.
- 2. Contractor shall maintain one copy of Record Specifications, including addenda, change orders, and similar modifications issued in printed form during construction. Mark up variation in the actual work comparison with the text of specifications and modifications, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawings information and product data where applicable.

3. Contractor shall submit updates of Contract Drawings and Record Specifications with each monthly partial pay request. Failure to maintain accurate, up-to-date record documents shall be grounds for delaying payment.
4. Contractor shall submit one (1) copy of Record Documents per General Conditions.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 35 13

SPECIAL PROJECT PROCEDURES

PART 1 – GENERAL

1.01. PROJECT MANAGEMENT

- A. The Contractor shall schedule and coordinate all work by his forces and subcontractors and others involved to maintain the accepted progress schedule. The Contractor's duties also include the planning of work, including traffic control, the scheduling or ordering and delivery of materials, and checking and control of all work under this contract. Construction schedules shall be submitted to the Engineer for review prior to the start of any work. Schedules shall be verified or updated as necessary.
- B. The Contractor shall be responsible for complete supervision and control of his subcontractors as though they were his own forces. Notice to the Contractor shall be considered notice to all affected subcontractors.
- C. The Contractor shall appoint a qualified representative to act as the "Project Coordinator, Project Manager or Project Superintendent" who shall be responsible for coordinating all work and providing liaison with the Engineer and the Owner. This person shall be responsible for all duties described above and in all matters represent the Contractor regarding this project in the absence of a Corporate Officer or Principal of the firm. This person will be on the Project site for the duration of the project.
- D. The Contractor shall employ only competent and skilled personnel on the work. At all times when the work is in progress, the Contractor shall have a competent Superintendent or Foreman present with authority to receive orders, execute the work and to promptly supply materials, tools, plant equipment and labor as may be required. The person must be fluent and literate in the English language. Should the Engineer so demand, the Contractor shall immediately remove any Superintendent, Foreman, or worker whom the Engineer considers incompetent, undesirable, or both.

1.02 CREW SUPERVISION

- A. The contractor's laborers, pipelayer(s) and equipment operator(s) must be supervised by a non-operator certified foreman and/or non-operator certified superintendent experienced in installation of ductile iron and steel pressure water mains. The foreman's and superintendent's résumé, including OSHA certification status, must be submitted to the Engineer and Owner for review prior to award of the contract.

1.03 WORK HOURS

- A. Except in the case of an emergency or other unusual circumstance, no work shall be performed on the project outside of Owner-approved work hours. Except in an emergency, the Contractor must obtain approval of the Owner before scheduling additional work hours.
- B. There shall be no traffic lane closures during weekdays between the hours of 6 AM to 9 AM and 3:30 PM to 6 PM. Exception to this requirement will only be made with the approval of the Georgia DOT and, if required, by the Cobb County DOT.

1.04 CLOSING VALVES

- A. Except in an emergency, the Contractor shall not close or open valves on any water main without first gaining approval from the Owner of the water main.

1.05 TRENCH SAFETY ORDINANCE

- A. Cobb County has enacted a local ordinance which requires strict adherence to OSHA regulations Subpart P, Part 1926 pertaining to trenching and excavation. All bidders are advised to be familiar with both the OSHA regulations and the local ordinance before bidding this project.

1.06 OWNER FURNISHED MATERIALS

- A. There are no Owner-furnished materials on this project. Contractor shall supply all materials.

1.07 EROSION CONTROL

- A. It is the Contractor's responsibility to furnish, install and maintain any and all erosion control devices and silt fencing as may be required by any County, State or Federal agency that may have jurisdiction over the area in which work is being performed in the execution of this contract. In the event there are conflicting requirements, the most stringent regulations shall apply. It will be the responsibility of the Contractor to remove all erosion control devices and silt fencing upon completion of the work at such time that a suitable ground cover has been established and final stabilization has been reached. See Section 01 55 13 for further details on erosion control methods.

1.08 WORK ZONE TRAFFIC CONTROL

- A. The Contractor shall provide, erect and maintain all necessary barricades, message boards, suitable and sufficient warning lights, danger signals, and signs, provide sufficient number of watchmen, and take all necessary precautions for the protection of the work and the safety of the public. Contractor shall comply with all local and state ordinances concerning traffic control. No road closings will be allowed without prior approval of the local governing authority.
- B. All personnel involved in traffic control and doing any flagging must have received training and a certificate upon completion of the training from a GDOT approved training program. All costs for providing certified flaggers will be borne by the Contractor. Failure to provide certified flaggers as required above shall be reason for suspending work regarding the flagger(s) until a certified flagger can be provided. Flagging personnel shall be equipped with radio communication.
- C. It is the Contractor's responsibility to submit and obtain approval for traffic control from the appropriate governing authority. Contractor shall prepare a Traffic Control Plan and shall be solely responsible for all planning, permitting and implementation of all traffic control measures and procedures. Owner and Engineer assume no liability for traffic control.
- D. The Contractor shall have on-site a Certified Traffic Control Supervisor. The Certified Traffic Control Supervisor shall have completed Temporary Traffic Control Design and Supervision instruction by the National Safety Council or equivalent training. Proof of such training will be provided. The Certified Traffic Control Supervisor shall be on-site during all times traffic is interrupted by construction activities; during normal work times and during emergencies outside normal work times. The Certified Traffic Control Supervisor shall have the authority

to direct necessary work activities to maintain a safety work environment for the public and for the workers.

1.09 PIPE CLOSURES

- A. Pipe closures shall be made in straight sections of pipe using a solid long body restrained mechanical joint sleeve. Installation shall include a filler/spacer ring to compensate for the final lap joint. Fit shall be as tight as practical. Closure shall be at least one pipe length away from an adapter. Closing with no spacer ring or by "bucking" pipe sections together with no sleeve will not be allowed.

1.10 ACCEPTANCE AND FINAL PAYMENT

- A. When the project provided for under this contract has been completed by the Contractor, and all parts of the work have been approved by the Engineer according to the contract, the Engineer shall, within ten (10) days unless otherwise provided, make final inspection and advise the Contractor to prepare a final estimate, showing the value of work as soon as the necessary measurements and computations can be made.
- B. Contractor and Owner acknowledge that all progress certificates or estimates upon which payments shall have been made, will have been based on approximations only, and will be subject to correction in the final payment. Contractor shall prepare the final estimate and submit the same for payment within ninety (90) days of notification of final acceptance of the project by the Engineer.
- C. If Contractor fails to submit a final estimate and bill within said ninety (90) day period, the Contractor will be deemed to have conclusively waived, relinquished and forfeited any amounts remaining due under this contract, and the Owner may defund the project and re-appropriate said funds with no further liability under this contract or otherwise to Contractor. The amount of the final estimate, less any sums that may have been deducted or retained under the provisions of this contract, will be paid to the Contractor within sixty (60) days after approval by the Engineer, provided that the Contractor has properly maintained and operated the project as specified under the attached specifications, and provided that he has furnished to the Owner a sworn affidavit to the effect that all bills are paid and no suits are pending in connection with the work performed or labor and material furnished under this contract.

1.11 TEST REQUIREMENTS

- A. The Contractor is responsible for providing temporary pipe restraint necessary to restrain the water main during hydrostatic test. The hydrostatic test pressure is as specified in Section 33 11 13 of these specifications. Water mains shall be tested independently of any existing water main prior to connection.

1.12 DISINFECTION OF WATER STORAGE FACILITIES

- A. After thoroughly cleaning the interior of a new potable water tank, the tank shall be disinfected by one of the three methods allowed in AWWA Standard C652-19.
- B. One disinfection method entails adding water containing a minimum of 50 mg/l chlorine in the tank to such depth that, when the tank is filled with potable water to the overflow level and held full for a period of at least 24 hours, there will be a free chlorine residual of not less than 2 mg/l. The full tank must be allowed to stand for 24 hours. All highly chlorinated water shall then be purged from the drain piping. Contractor shall submit a disinfection plan to the Engineer.

- C. Samples of water shall be taken from the tank and tested to demonstrate that the water in the tank is microbiologically satisfactory in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. Sampling and testing will be done by the Owner upon notification from the Contractor. Upon achieving satisfactory test results, the tank may be put into service by the Owner without draining the remaining water in the tank.

1.13 DISPOSAL OF MATERIALS

- A. The Owner reserves the right to retain ownership of any existing materials removed. The Contractor shall make Owner-designated materials available for recovery by the Owner. All other materials shall become the responsibility of the Contractor for disposal.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 35 13.53

MAINTENANCE OF UTILITY OPERATIONS DURING CONSTRUCTION

PART 1 – GENERAL

1.01 SCOPE

- A. The existing Wyckoff WTP will be maintained in continuous operation by the Owner during the entire construction period of the Project as hereinafter specified. The intent of this section is to outline the minimum requirements necessary to allow the Owner to continuously operate and maintain the treatment facility and remain in compliance with all water quality regulations.
- B. Work under the Project shall be scheduled and conducted so as not to impede any treatment process, reduce the quality of the plant's finished water or cause operational interferences except as explicitly permitted hereinafter.

1.02 GENERAL CONSTRAINTS

- A. The Contractor shall schedule the Work so that the Wyckoff WTP is maintained in continuous operation at 100% treatment capacity. Only one of the existing clearwells shall be taken out of service at any given time.
- B. All short-term system or partial system shutdowns shall be approved by the Engineer. If in the judgement of the Engineer, a requested shutdown is not required for the Contractor to perform the Work, the Contractor shall utilize approved alternative methods to accomplish the Work. All shutdowns shall be coordinated with and scheduled at times suitable to the Owner. No shutdowns shall be planned for Fridays or days immediately preceding holidays observed by the Owner.
- C. Short-term shutdowns shall not begin until all required materials are on hand and ready for installation. Each shutdown period shall commence at a time approved by the Owner, and the Contractor shall proceed with the Work continuously, start to finish, until the Work is completed and normal plant operation is restored. If the Contractor completes all required Work before the specified shutdown period has ended, the Owner may immediately place the existing system back into service.
- D. The Contractor shall schedule short-term shutdowns in advance and shall present all desired shutdowns in the 30- and 60-day schedules at the progress meetings (see Section 01 31 19). Shutdowns shall be fully coordinated with the Plant Manager at least two weeks before the scheduled shutdown and again at 48 hours before the scheduled shutdown. Owner personnel shall operate Owner's facilities involved in the short-term shutdowns.
- E. The Engineer or Owner shall have the authority to order Work stopped or prohibited that would, in his opinion, unreasonably result in interrupting the necessary functions of the plant operations.

- F. If the Contractor impairs performance or operation of the plant as a result of not complying with specified provisions for maintaining plant operations, then the Contractor shall immediately make all repairs or replacements and do all work necessary to restore the plant to operation to the satisfaction of the Engineer. Such work shall progress continuously to completion on a 24-hours per day, seven workdays per week basis.

1.03 GENERAL OPERATING REQUIREMENTS, CONSTRAINTS, AND CONSTRUCTION REQUIREMENTS

A. Access to Plant Site, Roadways, and Parking Areas

1. Access to the plant by Contractor shall be only by the entrance to the sludge yard from Mars Hill Road. Refer to the Job Site Security section of these Specifications.
2. An unobstructed traffic route through the Main Gate shall be maintained at all times for the Owner's operations personnel and maintenance equipment to access all areas of the plant.
3. Parking for personal vehicles of construction personnel shall be in designated areas only. The Contractor shall be responsible for providing access to and for preparing and maintaining/approved parking areas.
4. Construction traffic within the plant shall follow an approved construction traffic routing plan unless exceptions are approved in advance by the Engineer.
5. An unobstructed traffic route around the plant site shall be maintained at all times for the Owner's operations personnel, maintenance equipment, and emergency vehicles. Vehicular access to the treatment units and buildings for Owner personnel shall be maintained at all times by the Contractor.

B. Personnel Access

1. Treatment plant personnel shall have access to all areas which are in operation. The Contractor shall locate stored materials, dispose of construction debris and trash, provide temporary walkways, provide temporary lighting, and other such work as directed by the Engineer to maintain personnel access to areas in operation. Access and adequate parking areas for plant personnel must be maintained throughout construction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 35 25

CONFINED SPACE ENTRY

PART 1 – GENERAL

1.01 GENERAL

- A. Whenever it is necessary for the Engineer to enter a confined space to perform inspection or other functions necessary to the project, the Contractor shall provide two trained personnel to assist and equipment appropriate to the type of confined space to be entered.

PART 2 – PRODUCTS

2.01 EQUIPMENT

- A. The Contractor shall follow all the requirements provide stipulated in 29 CFR 1910.146 and shall provide all equipment necessary to perform confined space entry in accordance with 29 CFR 1910.146. Equipment shall include but not be limited to the following:
 - 1. Tripod, Hoist and Harness
 - 2. Gas Monitor
 - 3. Two Way Radios
 - 4. Cellular Telephone

2.02 PERSONNEL

- A. The Contractor shall provide two personnel trained in confined space entry (to the level of attendant) to assist the engineer with confined space entry.

2.03 TRAINING

- A. If the equipment provided by the contractor is different from equipment the engineer is accustomed to, then the contractor shall provide training in the use of that equipment. The contractor, however, is not responsible for providing confined space entry training to engineer.

PART 3 – EXECUTION

3.01 GENERAL

- A. The Contractor will be provided with a list of the Owner's and Engineer's personnel that are trained in confined space entry as entrants or attendants. Persons not trained in confined space entry will not be allowed entry.
- B. The Contractor shall be responsible for providing, filling out, and filing confined space entry permits.

- END OF SECTION -

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SECTION 01 35 53
JOB SITE SECURITY

PART 1 – GENERAL

1.01 SUBMITTALS

- A. Informational Submittals: Example Block Badge.

1.02 BARRICADES, LIGHT, 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, and 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.

1.03 SITE SECURITY

- A. The Owner will not be responsible for security of the Contractor's equipment, materials, and other items on the Project Site.

1.04 GENERAL SITE SECURITY REQUIREMENTS

- A. The Contractor shall follow all security measures required by the Owner. Should these measures need to be changed during the course of the Contract due to Homeland Security mandates or otherwise, the Contractor will comply with the changes.
- B. The Contractor shall furnish, install, and maintain, for the duration of the Contract (i.e., from commencement of Contractor mobilization through completion of the construction and demobilization of the Contractor), an access control facility at the sludge yard gate entrance to the plant site off Mars Hill Road. No potable water or sanitary facilities will be available at this location; the Contractor shall supply temporary (bottled) water service and a portable sanitary facility at the guardhouse. Electric power will be available at the entrance gate. The Contractor shall be responsible for providing power to the guardhouse. The Contractor shall provide a telephone at the access control facility to be used for Project communications or emergency use only. Following completion of construction, the Contractor shall remove the guardhouse and return the area to its pre-construction condition.

- C. The control facility shall be manned continuously from a period beginning at least 1 hour prior to the Contractor's normal starting time and ending at least 15 minutes after all of Contractor's workers leave each working day. Owner will not be responsible for allowing entry of Contractor's workers or delivery trucks that arrive prior to daily manning of the control facility. If Contractor requests that workers be allowed to stay onsite beyond normal working hours, the control facility shall continue to be manned for at least 15 minutes after all of Contractor's workers leave the Site. The control facility shall also be manned during any weekend days that the Contractor works at the Project Site. Contractor shall secure the services of one of the following Private Security Companies, approved by the Owner:
 - 1. Guardsmark, Inc.
 - 2. Allied Barton Security Services.
 - 3. North American Security.
- D. Owner reserves the right to terminate the services of the Private Security Company at any time during the Contract. In the case of such an event, the Contractor shall comply with the Owner's directions.
- E. Private Security Company shall post a guard at the construction entrance gate during construction hours and such guard shall refuse admittance to all persons and deliveries if proper identification and notification requirements are not met.
- F. Contractor shall not be allowed access to the Work unless the Private Security Company guard is present at the construction entrance gate, and such construction entrance gate shall be locked at all times when the guard is not present.
- G. Contractor's sole access point to the Work shall be through the sludge yard entrance gate. The creation of alternate entry gates shall not be allowed. The use of the plant's main gate entrance shall not be allowed.
- H. During the Contractor's mobilization period, the Owner may waive, at its sole discretion, some or all of these requirements for a period of time not to exceed 4 weeks.
- I. Owner may restrict Contractor's access to any portions of the Site at any time for security reasons and the Contractor shall not access any portions of the Site that are not directly related to the Work.
- J. Owner has the right to deny entrance to the Site to any persons that do not comply with the provisions of this section of Specifications and to take legal action against any persons found on the Site not complying with the provisions of this section of Specifications.

1.05 PERSONNEL ACCESS REQUIREMENTS

A. Security Badges:

- 1. Owner shall issue photo identification badges, upon security background clearance, for the Engineer and Contractor's management personnel. Sample Background Check Form for Security Access form is included with this Specification.

2. The Owner shall, at its discretion, provide security access privileges to individual badges.
3. No less than 3 days prior to requesting a photo identification badge for any employee, the Contractor shall provide the Owner with the full names, and any other such personal information as required in order to conduct a security background check. The employee shall sign a release form allowing the Owner to conduct a background check. Refusal to sign the release form is grounds for refusing admission to the Site. The Owner will have the right to conduct the background checks and the authority to refuse to issue a security badge to any person without disclosing the reason for such refusal. The Owner will have the right to withdraw security badge privileges to an individual at any time.
4. Employees shall wear the badge in a visible location on their person at all times while on the Site.

B. Block Badges:

1. Contractor shall issue block badges for Contractor and Subcontractor employees. The Block Badges format shall be approved by Owner and meet the following criteria:
 - a. Minimum overall dimension of 2-1/8 inch by 3-3/8 inch.
 - b. Individual's Name or Block Badge number, Contractor's name, Project name.
 - c. Badges issued to subcontractors shall contain the subcontractors name as well.
 - d. Durable and waterproof.
 - e. All block badges shall contain a common background color scheme so as to make the badges readily identifiable for the Project.
2. The Contractor shall submit sample badges (block) to the Owner for approval prior to issuance.
3. Employees shall wear the badge in a visible location on their person at all times while on the Project Site.
4. Any employee on the Project site for more than 10 consecutive working days shall be required to obtain an Owner-issued photo identification badge in accordance with paragraph A above, except that laborers working under the direct supervision of a foreman may use the Contractor-issued block badge in accordance with this paragraph B.

C. Block Badge – Issuance:

1. Contractor (not the Private Security Company) shall issue block badges at the gate to all persons upon entrance to the Site.
 - a. Once inside the gate, persons wearing block badges on the Site must always be escorted and under visible supervision by a Contractor or Subcontractor employee wearing a photo identification badge.

- b. The block badges shall be turned back in to the Contractor when the person leaves the Project Site.
 - c. Employees shall wear the badge in a visible location on their person at all times while on the Project Site.
- 2. The Contractor shall issue a known quantity of each set of block badges and shall, on a weekly basis, report to the Owner the number of block badges:
 - a. Originally and subsequently manufactured.
 - b. In the Contractor's possession.
 - c. Lost or unaccounted for.
 - d. Otherwise accounted for with an explanation of such.
- 3. Rotating Block Badge System:
 - a. Four separate sets of block badges shall be issued for the Project under each Security Badge System.
 - b. Each separate set of block badges shall contain a varying color scheme or other identification so as to make it readily distinguishable from the other sets of block badges from a distance of 20 feet.
 - c. Contractor shall issue a separate set of block badges no less than every 3 months.
 - d. Persons found on the Site using block badges authorized for other periods will be treated as trespassers and are subject to legal actions.
 - e. At any time upon the request of the Owner, the Contractor shall begin using a separate set of block badges.
- 4. Authorized Admittance List:
 - a. Contractor shall provide to the Owner, periodically and upon request, a list of all persons, employees and subcontractors, authorized for admittance. This list will identify employees with photo identification badges and those routinely issued block badges.
 - b. The minimum frequency for submitting this list is on the first day of each month but the Owner may increase this frequency to the beginning of business each day.
- 5. Replacement of Lost Badges and Complete Security Badge System:
 - a. Lost badges shall be replaced at the Contractor's expense (although the Contractor may charge individual employees for lost badge replacement).
 - b. Complete Badge System Replacement:

- 1) Contractor shall include, in the lump sum bid, the cost for replacing the complete security badge system two times during the course of the Project.
- 2) The replacement badge system shall meet the requirements specified herein but shall contain a differing format and color scheme sufficient to make the replacement system readily distinguishable from the preceding badge system. The Owner shall approve the replacement badge system prior to its issuance by the Contractor.
- 3) Issuance of a replacement badge system shall be upon the request of the Owner.

1.06 VEHICLE ACCESS REQUIREMENTS

A. Non-company Vehicles:

1. Non-company vehicles (employee vehicles driven for commuting) will be limited to the construction employee parking areas as authorized by the Owner.
2. Non-company vehicles parked outside of the authorized areas will be towed.

B. Company Vehicles: Company-owned or employee-owned vehicles being used in the course of the Work shall be clearly marked with the company name while on the site (magnetic signs are acceptable).

1.07 CONSTRUCTION DELIVERY REQUIREMENTS

- A. Contractor shall provide a daily list of expected deliveries to the Owner, including the names of drivers and passengers.
- B. Contractor shall meet and escort the following:
 1. All unexpected deliveries.
 2. Expected deliveries with drivers or passengers not on the daily list of expected deliveries provided by the Contractor.
 3. At any time as requested by the Owner or Private Security Company gate guard.
- C. Delivery drivers shall remain with the delivery vehicle at all times, except where the delivery person must enter the Contractor's trailer for paperwork purposes.
- D. The delivery driver and all passengers shall submit photo identification upon request. Persons without photo identification will be refused entry.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SUPPLEMENTS

A. The supplement listed below, following “End of Section,” is a part of this Specification:

1. APPLICANT'S DISCLOSURE & AUTHORIZATION FOR BACKGROUND SCREENING (1 page)

- END OF SECTION -

APPLICANT'S AUTHORIZATION FOR BACKGROUND SCREENING

ACKNOWLEDGMENT AND AUTHORIZATION FOR BACKGROUND CHECK

I acknowledge receipt of the separate document entitled DISCLOSURE REGARDING BACKGROUND INVESTIGATION and A SUMMARY OF YOUR RIGHTS UNDER THE FAIR CREDIT REPORTING ACT and certify that I have read and understand both of those documents. I hereby authorize the obtaining of "consumer reports" and/or "investigative consumer reports" by the [Employer] ("the Company") at any time after receipt of this authorization and throughout my employment, if applicable. To this end, I hereby authorize, without reservation, any law enforcement agency, administrator, state or federal agency, institution, school or university (public or private), information service bureau, employer, or insurance company to furnish any and all background information requested by InfoMart, Inc., 1582 Terrell Mill Road, Marietta, GA 30067, 800-800-3774, www.infomart-usa.com, and/or Employer itself. I agree that a facsimile ("fax"), electronic or photographic copy of this Authorization shall be as valid as the original.

New York applicants only: Upon request, you will be informed whether or not a consumer report was requested by the Company, and if such report was requested, informed of the name and address of the consumer reporting agency that furnished the report. You have the right to inspect and receive a copy of any investigative consumer report requested by the Company by contacting the consumer reporting agency identified above directly. By signing below, you acknowledge receipt of Article 23-A of the New York Correction Law.

New York City applicants only: By signing this form, you further authorize the Company to provide you with a copy of your consumer report, the New York City Fair Chance Act Notice form, and any other documents, to the extent required by law, at the mailing address and/or email address you provide to the Company.

Minnesota applicants only: You have the right to submit a written request to the consumer reporting agency for a complete and accurate disclosure of the nature and scope of any consumer report the Company ordered about you. The consumer reporting agency must provide you with this disclosure within five business days after its receipt of your request or the report was requested by the Company, whichever date is later. Please check this box if you would like to receive a copy of a consumer report if one is obtained by the Company.

Washington State applicants only: You also have the right to request from the consumer reporting agency a written summary of your rights and remedies under the Washington Fair Credit Reporting Act.

Oklahoma applicants only: Please check this box if you would like to receive a copy of a consumer report if one is obtained by the Company.

Applicant Information (Please Print)

* This information will be used for purposes of background screening only and will not be used in making any employment decisions.

Applicant Name: (First Middle Last)	Current Address: (street address)
Other Name(s) Used: (like Maiden)	City: State: Zip:
Gender: * <input type="checkbox"/> Male <input type="checkbox"/> Female	Former Address: (1)
Social Security Number: *	City: State: Zip:
Driver's License Number: State:	Former Address: (2)
Date of Birth: * Place of Birth: (City, State, Country)	City: State: Zip:

Signature: _____

Date: _____

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SECTION 01 45 29

QUALITY CONTROL

PART 1 – GENERAL

1.01 SCOPE

A. Testing Laboratory Services

1. Laboratory testing and checking required by the Specifications, including the cost of transporting all samples and test specimens, shall be provided and paid for by the Contractor unless otherwise indicated in the Specifications.
2. Materials to be tested include but are not necessarily limited to the following: cement, concrete aggregate, concrete, bituminous paving materials, structural and reinforcing steel, waterproofing, select backfill, crushed stone or gravel and sand.
3. Tests required by the Owner shall not relieve the Contractor from the responsibility of supplying test results and certificates from manufacturers or suppliers to demonstrate conformance with the Specifications.
4. Procedure:
 - a. The Contractor shall plan and conduct his operations to permit taking of field samples and test specimens, as required, and to allow adequate time for laboratory tests.
 - b. The collection, field preparation and storage of field samples and test specimens shall be as directed by the Engineer with the cooperation of the Contractor.
5. Significance of Tests: Test results shall be binding on both the Contractor and the Owner and shall be considered irrefutable evidence of compliance or noncompliance with the Specification requirements, unless supplementary testing shall prove, to the satisfaction of the Owner, that the initial samples were not representative of actual conditions.
6. Supplementary and Other Testing: Nothing shall restrict the Contractor from conducting tests he may require. Should the Contractor at any time request the Owner to consider such test results, the test reports shall be certified by an independent testing laboratory acceptable to the Owner. Testing of this nature shall be conducted at the Contractor's expense.

1.02 FIELD TESTING OF EQUIPMENT

- A. All equipment shall be set, aligned and assembled in conformance with the manufacturer's drawings and instructions.

1.03 IMPERFECT WORK, EQUIPMENT, OR MATERIALS

- A. Any defective or imperfect work, equipment, or materials furnished by the Contractor which is discovered before the final acceptance of the work, as established by the Certificate of Substantial Completion, or during the subsequent guarantee period, shall be removed immediately even though it may have been overlooked by the Engineer and estimated for payment. Any equipment or materials condemned or rejected by the Engineer shall be tagged as such and shall be immediately removed from the site. Satisfactory work or materials shall be substituted for that rejected.
- B. The Engineer may order tests of imperfect or damaged work, equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor; and the nature, tester, extent and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the work, equipment, or material was not impaired, consistent with the final general appearance of same, the work, equipment, or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the questionable work, equipment, or materials has been impaired, then such work, equipment, or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work, equipment, or material in lieu of performing the tests.

1.04 INSPECTION AND TESTS

- A. The Contractor shall allow the Engineer ample time and opportunity for testing materials and equipment to be used in the work. He shall advise the Engineer promptly upon placing orders for material and equipment so that arrangements may be made, if desired, for inspection before shipment from the place of manufacture. The Contractor shall at all times furnish the Engineer and his representatives, facilities including labor, and allow proper time for inspecting and testing materials, equipment, and workmanship. The Contractor must anticipate possible delays that may be caused in the execution of his work due to the necessity of materials and equipment being inspected and accepted for use. The Contractor shall furnish, at his own expense, all samples of materials required by the Engineer for testing, and shall make his own arrangements for providing water, electric power, or fuel for the various inspections and tests of structures and equipment.
- B. The Contractor shall furnish the services of representatives of the manufacturers of certain equipment, as prescribed in other Sections of the Specifications. The Contractor shall also place his orders for such equipment on the basis that, after the equipment has been tested prior to final acceptance of the work, the manufacturer will furnish the Owner with certified statements that the equipment has been installed properly and is ready to be placed in functional operation. Tests and analyses required of equipment shall be paid for by the Contractor, unless specified otherwise in the Section which covers a particular piece of equipment.
- C. Where other tests or analyses are specifically required in other Sections of these Specifications, the cost thereof shall be borne by the party (Owner or Contractor) so designated in such Sections. The Owner will bear the cost of all tests, inspections, or investigations undertaken by the order of the Engineer for the purpose of determining

conformance with the Contract Documents if such tests, inspection, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by the Engineer as a result of such tests, inspections, or investigations, the Contractor shall bear the full cost thereof or shall reimburse the Owner for said cost. In this connection, the cost of any additional tests and investigations, which are ordered by the Engineer to ascertain subsequent conformance with the Contract Documents, shall be borne by the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

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SECTION 01 45 33

SPECIAL INSPECTIONS

PART 1 – GENERAL

1.01 SCOPE

- A. This section defines the requirements for Special Inspections as required by Section 1704 of the International Building Code (IBC) and any State or local amendments.
- B. The Engineer will prepare a Statement of Special Inspections, which identifies the type and extent of required Special Inspections. The Contractor will retain one or more Special Inspections Agencies to perform Special Inspection services. The firm(s) will be designated by the Owner. Payment will be made under the Bid Cash Allowance, unless the agency is the Engineer. These Agencies shall be independent from the Contractor and approved by the Building Official.
- C. The Contractor shall plan and conduct his operations as to schedule and allow Special Inspections, providing adequate time and safe access for inspections. The Contractor shall coordinate requirements for Special Inspections with the Special Inspections Agency.
- D. Special Inspections shall be in addition to inspections performed by Building Officials that are specified in IBC Section 110.
- E. Special Inspections shall be in addition to any Structural Observations required by IBC Section 1704.
- F. Special Inspections do not supersede other inspections and testing required by the Contract Documents to satisfy the Contractor's quality control responsibility. Contractor shall be responsible for all costs associated with quality control requirements as required by other sections of the Specifications.
- G. Special Inspections shall not relieve Contractor's obligation to perform and complete work in accordance with Contract Documents. Results of Special Inspections activities, including any discrepancies that are noted or not noted, shall never constitute an acceptance of work that is not in accordance with the Contract Documents.
- H. This section does not apply to construction equipment, shoring, earth retention systems, and temporary structures used by the Contractor in construction and not detailed in the Contract Documents. The Contractor shall be solely responsible for means, methods, techniques, sequences, or procedures of construction and any associated building code requirements.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Special Inspections requirements apply to work detailed in other sections of the Specifications. Special Inspections requirements shall be in addition to any other

inspection or quality control requirements detailed in other sections of the Specifications. See individual specification sections for type of work in question.

1.03 DEFINITIONS

- A. Periodic Special Inspections: The part-time or intermittent observation of work requiring Special Inspection by a Special Inspector who is present in the area where the work has been or is being performed and at the completion of the work.
- B. Continuous Special Inspections: The full-time observation of work requiring Special Inspection by a Special Inspector who is present in the area where the work is being performed.
- C. Engineer: The Registered Design Professional in Responsible Charge of each building system. These systems include structural, mechanical, electrical, and architectural components.
- D. Special Inspections Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, which has been approved by the Building Official and is retained by the Owner.
- E. Special Inspector: Individual employed by or retained by the Special Inspections Agency who is qualified in inspection of a particular type of construction and conducts inspection activities in that type of construction, as required by this section.
- F. Statement of Special Inspections: Document prepared by the Engineer and submitted to the Building Official which identifies the type and extent of required Special Inspections.
- G. Approved Fabricator: Fabricator who has been registered and approved by the Building Official to perform a particular type of work without Special Inspections.

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents and all other documents referenced in the specifications. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. Georgia State Minimum Standard Building Code
 - 2. ACI 318 Building Code Requirements for Structural Concrete
 - 3. ACI 530.1/ASCE 6 Specifications for Masonry Structures
 - 4. AISC "Code of Standard Practice"
 - 5. AISC "Specification for Structural Steel Buildings"
 - 6. AISC 348 "The 2009 RCSC Specification for Structural Joints"
 - 7. AWS "Structural Welding Code"

8. Aluminum Association Specifications for Aluminum Structures

1.05 SUBMITTALS

A. The Contractor shall submit the following in accordance with Section 01 33 00, Submittals.

1. The Contractor shall submit a written statement of responsibility to the Building Official and Engineer using the attached form entitled "Contractor's Statement of Responsibility" prior to beginning work. A statement is required from each Contractor who has responsibility for construction or fabrication of a main wind- or seismic-force-resisting system, designated seismic system, or a wind- or seismic-resisting-component listed in the Statement of Special Inspections.
2. The Contractor shall submit qualifications of any fabricators they intend to use that may qualify as Approved Fabricators to the Special Inspections Agency for review.

B. The Special Inspections Agency shall submit the following in accordance with Section 01 33 00, Submittals.

1. The Special Inspections Agency shall provide a statement of qualifications showing relative experience, training, and certification(s) for each Special Inspector to the Building Official, if requested.
2. The Special Inspections Agency shall review fabricator qualifications and submit them to the Building Official for approval as an Approved Fabricator if requested.
3. Special Inspectors shall keep detailed inspection records, including all inspections, tests, similar services, and any discrepancies and corrections. Any discrepancies and corrections shall be reported to the Building Official and the Engineer in all required reports, unless otherwise required by the Building Official.
4. The Special Inspections Agency shall submit Interim Reports to the Building Official and the Engineer documenting required Special Inspections and correction of any discrepancies using the attached form entitled "Interim Report of Special Inspections" at the frequency specified in the Statement of Special Inspections.
5. The Special Inspections Agency shall submit to the Building Official and the Engineer a Final Report documenting required Special Inspections and correction of any discrepancies using the attached form entitled "Final Report of Special Inspections." The Final Report shall be submitted at a point in time agreed upon by the Owner and the Building Official at the Pre-inspection Meeting.
6. Where work is done by Approved Fabricators, the Special Inspections Agency shall coordinate the submittal of a certificate of compliance to the Building Official and Engineer using the attached form entitled "Fabricator's Certificate of Compliance."

1.06 SPECIAL INSPECTOR QUALIFICATIONS

Special Inspectors shall meet minimum qualifications established by the Building Official and shall be approved by the Building Official.

1.07 OFF-SITE FABRICATIONS

- A. When structural elements or assemblies are fabricated off site, Special Inspections are required to be performed in the fabricator's shop unless the fabricator is an Approved Fabricator. Special Inspections are not required if work is done on the premises of an Approved Fabricator.
- B. Fabricators shall maintain detailed fabrication and quality control procedures to ensure workmanship and conformance with Contract Documents and reference standards. The Special Inspections Agency shall review the fabricator's quality control procedures and coordinate required Special Inspections with the fabricator and the Contractor.
- C. The Contractor shall submit qualifications of fabricators seeking Approved Fabricator status to the Special Inspections Agency for review. Approval as an Approved Fabricator shall be given by the Building Official upon the recommendation of the Special Inspections Agency or upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PRE-INSPECTION MEETING

At least two weeks prior to beginning work, a Pre-inspection Meeting shall be held to discuss the Special Inspection procedures and submittals. The following parties shall participate: the Engineer, a Special Inspections Agency representative, the Contractor, Subcontractors, Testing Agencies, and the Building Official. The type of meeting (in-person or teleconference) and location of meeting shall be determined by the Building Official.

3.02 STATEMENT AND SCHEDULE OF SPECIAL INSPECTIONS

The Special Inspections Agency and all Special Inspectors are required to comply with all requirements of the Statement of Special Inspections and the Schedule of Special Inspections. Together, these documents identify materials, systems, components, and work that are required to have Special Inspections, the type and extent of Special Inspections, and whether they will be continuous or periodic.

3.03 SPECIAL INSPECTIONS AGENCY REQUIREMENTS AND RESPONSIBILITIES

- A. The Special Inspections Agency shall be an established and recognized agency regularly engaged in conducting tests or furnishing inspection services, which has been

approved by the Building Official and is retained by the Owner. The Agency shall demonstrate competence, to the satisfaction of the Building Official, for the inspection of the particular type of construction or operation requiring Special Inspection.

- B. The Special Inspections Agency shall maintain detailed inspection records, including a copy at the jobsite, and all records shall be available upon request by the Engineer or the Building Official. The Agency shall submit all required reports to the Engineer and Building Official. Where Engineer approval is required for corrections, the Special Inspector shall maintain copies of all related correspondence and submit with all required reports. The Agency shall coordinate all required Special Inspection activities with the Special Inspectors, the Contractor, and any fabricators and shall coordinate designation of fabricators as Approved Fabricators when requested.

3.04 SPECIAL INSPECTORS' REQUIREMENTS AND RESPONSIBILITIES

- A. All Special Inspectors shall meet the qualification requirements determined by the Building Official for the particular type of inspection services they will be providing and shall be approved by the Building Official. Special Inspectors shall submit written documentation demonstrating their competence and experience or training to the Building Official for approval of their qualifications.
- B. Special Inspections shall be performed in accordance with all requirements of the Statement of Special Inspections, the Schedule of Special Inspections, the IBC, and any State or local amendments. Special Inspectors shall maintain detailed inspection records, including a copy at the jobsite, and all records shall be available upon request by the Engineer or the Building Official. Special Inspectors shall submit all required reports to the Engineer and the Building Official. Where Engineer approval is required for corrections, the Special Inspector shall maintain copies of all related correspondence and submit with all required reports. Special Inspectors shall coordinate inspection requirements and timing with the Contractor.
- C. Any discrepancies in work noted by the Special Inspector shall be brought to the immediate attention of the Contractor for correction. Special Inspectors shall coordinate correction of discrepancies with the Contractor. Any corrections of discrepancies that result in changes to the work as shown on the Contract Documents shall be approved by the Engineer. If noted discrepancies are not corrected, the Special Inspector shall notify the Contractor, the Engineer, and the Building Official. All noted discrepancies and corrections shall be documented in all inspection records and all required reports.

3.05 CONTRACTOR RESPONSIBILITIES

- A. Each Contractor responsible for the construction or fabrication of a main wind- or seismic-force-resisting system, designated seismic system, or a wind- or seismic-resisting-component listed in the Statement of Special Inspections shall submit a Statement of Responsibility to the Building Official and Engineer prior to the commencement of work. The Statement of Responsibility shall contain acknowledgement of the special requirements contained in the Statement of Special Inspections.
- B. The Contractor shall coordinate requirements of Special Inspections with the Special Inspections Agency and the Special Inspectors and shall provide adequate time and access to conduct inspections. The Contractor is solely responsible for providing safe

access and any necessary safety equipment required to conduct inspections. The Special Inspector shall not supervise, direct, control, or have authority over or be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the Contractor to comply with Laws and Regulations applicable to the performance of the Work.

- C. Special Inspections shall not relieve the Contractor's obligation to perform and complete work in accordance with the Contract Documents. Results of Special Inspections activities, including any discrepancies that are noted or not noted, shall never constitute an acceptance of work that is not in accordance with the Contract Documents.
- D. The Contractor shall provide advance notice of work to be conducted that will require Special Inspections. If the Special Inspector is delayed in inspecting the work due to inadequate notice or completion of the work, the Contractor shall reimburse the Owner for the cost of additional subsequent Special Inspections.
- E. The Contractor shall promptly correct any discrepancies noted by the Special Inspectors. Any corrections of discrepancies that result in changes to the work as shown on the Contract Documents shall be approved by the Engineer. Where Engineer approval is required, the Contractor shall report the discrepancy to the Engineer in accordance with provisions of the General Conditions. The Engineer will authorize any changes to the Contract Documents required for the correction in accordance with provisions of the General Conditions. Copies of all correspondence related to the correction shall be submitted concurrently to the Special Inspections Agency.

3.06 BUILDING OFFICIAL OR AUTHORITY RESPONSIBILITIES

The Building Official will approve qualifications of the Special Inspections Agency, all Special Inspectors, and any Approved Fabricators. The Building Official will approve all forms submitted by the Contractor, any Approved Fabricators, the Engineer, the Special Inspections Agency, and the Special Inspectors. The Building Official and the Special Inspections Agency shall agree to the frequency of Interim Reports and the submittal deadline for the Final Report.

3.07 ENGINEER RESPONSIBILITIES

The Engineer shall complete the Statement of Special Inspections and the Schedule of Special Inspections. The Engineer shall respond to discrepancies noted by the Special Inspector, if required.

3.08 OWNER RESPONSIBILITIES

The Owner will select the Special Inspections Agency to perform Special Inspections during construction.

3.09 MINIMUM INSPECTION REQUIREMENTS

Detailed requirements for Special Inspections are shown in the Statement of Special Inspections and the Schedule of Special Inspections, which references the IBC, applicable code standards, and any State or local amendments. Special Inspections

shall be performed in accordance with all requirements of the Statement of Special Inspections, the Schedule of Special Inspections, the IBC, and any State or local amendments. Additional requirements for specific materials listed in other sections of these specifications shall also be satisfied. The frequency of inspections shall be continuous or periodic as indicated in the Schedule of Special Inspections and in accordance with applicable building codes.

3.10 DISCREPANCIES AND CORRECTIVE MEASURES

- A. The Special Inspector shall bring any discrepancies to the immediate attention of the Contractor for correction. The Contractor shall promptly correct any discrepancies noted by the Special Inspectors. Special Inspectors shall coordinate correction of discrepancies with the Contractor. Discrepancies and their correction shall be noted in inspection records and in all required reports. Any corrections that result in changes to the work as shown on the Contract Documents shall be approved by the Engineer. Where Engineer approval is required, the Contractor shall report the discrepancy to the Engineer in accordance with provisions of the General Conditions. The Engineer will authorize any changes to the Contract Documents required for the correction in accordance with provisions of the General Conditions. Copies of all correspondence related to the correction shall be submitted concurrently to the Special Inspections Agency.
- B. If discrepancies are not corrected promptly, the Special Inspector shall notify the Contractor, the Engineer, and the Building Official using the attached form "Notification of Failure to Correct Discrepancies."

3.11 REPORTS

Special Inspectors shall maintain detailed inspection records, including a copy at the jobsite, and all records shall be available upon request by the Engineer or the Building Official. The Special Inspections Agency shall submit all required reports to the Building Official and Engineer as agreed upon with the Building Official. Reports shall indicate the inspections and testing performed and whether work inspected was or was not completed in conformance to Contract Documents and any corrective measures taken. Where Engineer approval is required for corrections, the Agency shall maintain copies of all related correspondence and submit with all required reports.

- THE FORMS ON THE FOLLOWING EIGHT (8) PAGES ARE PART OF THIS SECTION -

STATEMENT OF SPECIAL INSPECTIONS

PROJECT: Wyckoff WTP Clearwell #3
LOCATION: 3728 Mars Hill Road, Acworth, GA 30101
PERMIT APPLICANT:
APPLICANT'S ADDRESS:
ARCHITECT OF RECORD: N/A
STRUCTURAL ENGINEER OF RECORD: John Sobczak GA PE 41721
MECHANICAL ENGINEER OF RECORD: N/A
ELECTRICAL ENGINEER OF RECORD: Alec Zaychik GA PE 22613
REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: Pedro Rossello GA PE 17126

This Statement of Special Inspections is submitted in accordance with Section 1704 of the 2012 International Building Code. It shall be considered in conjunction with the Schedule of Special Inspections included in the Contract Documents. If applicable, it includes Requirements for Seismic Resistance and/or Requirements for Wind Resistance.

Are Requirements for Seismic Resistance included in the Statement of Special Inspections? [X] Yes [] No
Are Requirements for Wind Resistance included in the Statement of Special Inspections? [] Yes [X] No

The Special Inspector(s) shall keep detailed records of all inspections, including a copy at the jobsite. All records shall be available upon request by the Engineer or the Building Official. Any discrepancies shall be brought to the immediate attention of the Contractor. The Special Inspections Agency shall furnish Interim Reports to the Building Official and to the Engineer at the frequency indicated in the Statement of Special Inspections. A Final Report shall be submitted to the Building Official and the Engineer at the time agreed upon by the Owner and the Building Official.

Frequency of Interim Report submittals to the Building Official and the Engineer:
[] Weekly [] Bi-Weekly [X] Monthly Other; specify: _____

Special Inspections do not relieve the Contractor of the obligation to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

Type or print name

Signature Date

Building Official's Acceptance:

Signature Date

Permit Number:



**Statement of Special Inspections
Requirements for Seismic Resistance**

See the Schedule of Special Inspections for inspection and testing requirements.

Seismic Design Category: C

Statement of Special Inspection for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:

N/A

Description of designated seismic systems subject to special inspection and testing for seismic resistance:

N/A

Description of additional seismic systems and components requiring special inspections and testing:

N/A

Statement of Responsibility:

Each Contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

**Statement of Special Inspections
Requirements for Wind Resistance**

See the Schedule of Special Inspections for inspection and testing requirements

Basic Wind Speed (3 second gust): 120 m.p.h.

Wind Exposure Category: C

Statement of Special Inspection for Wind Resistance Required (Yes/No): No

Description of main wind force-resisting system subject to special inspection for wind resistance:

N/A

Description of wind force-resisting components subject to special inspection for wind resistance:

N/A

Statement of Responsibility:

Each Contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

FINAL REPORT OF SPECIAL INSPECTIONS

PROJECT: Wyckoff WTP Clearwell #3

LOCATION: 3728 Mars Hill Road, Acworth, GA 30101

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

ARCHITECT OF RECORD: _____

STRUCTURAL ENGINEER OF RECORD: John Sobczak GA PE 41721

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: Alec Zaychik GA PE 22613

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: Pedro M. Rossello GA PE 17126

To the best of my information, knowledge, and belief, Special Inspections required for this Project in accordance with Section 1704 of the 2012 International Building Code and any State or local amendments have been performed, and all work has been completed in accordance with the Contract Documents and all applicable standards, except as indicated.

The Special Inspection program does not relieve the Contractor of the obligation to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

This Final Report includes information submitted in previous Interim Reports numbered ____ to _____, as well as any Special Inspections, discrepancies, and corrections occurring since the last Interim Report, dated _____.

All items requiring Special Inspection are listed below. All inspections, tests, and similar services that were performed are listed and any discrepancies and corrections are indicated. If Engineer approval was required for any corrections, this is noted, and copies of all related correspondence are attached.

(Attach 8 1/2"x11" continuation sheet(s) if required to complete the description of corrections)

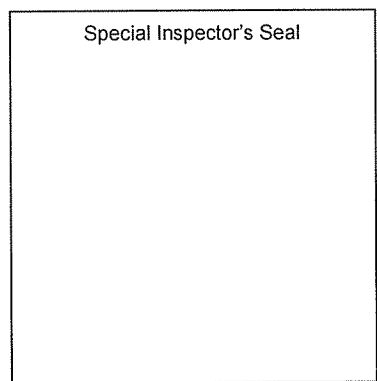
Prepared By:

Special Inspection Agency

Type or print name

Signature

Date



CONTRACTOR'S STATEMENT OF RESPONSIBILITY

Each Contractor responsible for the construction or fabrication of a main-wind- or seismic-force-resisting system, designated seismic system, or a wind- or seismic-resisting-component listed in the Statement of Special Inspections must submit this Statement of Responsibility prior to commencement of work on the system or component.

Project: _____

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and its requirements.

Name and Title (type or print)

Signature

Date

FABRICATOR'S CERTIFICATE OF COMPLIANCE

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5 of the 2012 International Building Code must submit this Fabricator's Certificate of Compliance at the completion of fabrication.

Project: _____

Fabricator's Name: _____

Address: _____

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated on my premises in strict accordance with the Contract Documents and applicable standards.

Name and Title (type or print)

Signature

Date

Attach copy of Building Official's approval of fabricator as an Approved Fabricator.

NOTIFICATION OF FAILURE TO CORRECT DISCREPANCY

City/County of:
Project name/Address:
List discrepancies, proposed correction, and Contractor response. If Engineer approval is required for any corrections, note this, and indicate whether approval was obtained. Attach copies of all related correspondence.
Comments:

Signed: _____

Date: _____

Print Full Name: _____

I.D. _____

Phone Number: _____

This report is to be submitted to the Building Official, the Contractor, and the Engineer.

- END OF SECTION -

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 – GENERAL

1.01 SCOPE

- A. The General Contractor shall provide temporary light and power, heating, water service and sanitary facilities for his operations, for the construction operations of the other Contractors of this Project at the site. The temporary services shall be provided for use throughout the construction period.
- B. The General Contractor shall coordinate and install all temporary services in accordance with the requirements of the utility companies having jurisdiction and as required by applicable codes and regulations.
- C. At the completion of the work, or when the temporary services are no longer required, the facilities shall be restored to their original conditions and any associated permits are closed out with the authority having jurisdiction.
- D. All costs in connection with the temporary services including, but not limited to, installation, utility company service charges, maintenance, relocation and removal shall be borne by the Contractor at no additional cost to the Owner.
- E. Some temporary facilities that may be required may be indicated on the Drawings; however, the Drawings do not necessarily show any or all of the temporary facilities that the Contractor ultimately uses to complete the work.
- F. Temporary Light and Power
 - 1. The temporary general lighting and small power requirements shall be serviced by 120/240 V, 1 phase, 3 wire temporary systems furnished and installed by the General Contractor. This service shall be furnished complete with main disconnect, overcurrent protection, meter outlet, branch circuit breakers, and wiring as required; including branch circuit breakers and wiring as required for furnishing temporary power to the various Contractor's field office service connections, all in accordance with the requirements of the servicing power company and applicable standards and codes. The meter for the temporary 120/240 V service for construction purposes shall be registered in the name of the General Contractor and all energy charges for furnishing this temporary electric power shall be borne by the General Contractor. Any Contractor with a need for power other than the 120/240 V, 1 phase, 3 wire shall provide such power at his own expense.
 - 2. The General Contractor shall make all necessary arrangements, and pay for all permits, inspections, and power company charges for all temporary service installations. All temporary systems shall comply with and meet the approval of the local authorities having jurisdiction. All temporary electrical systems shall consist of wiring, switches, necessary insulated supports, poles, fixtures, sockets, receptacles, lamps, guards, cutouts, and fuses as required to complete such

installations. The General Contractor shall furnish lamps and fuses for all temporary systems furnished by him and shall replace broken and burned out lamps, blown fuses, damaged wiring and as required to maintain these systems in adequate and safe operating condition. All such temporary light and power system shall be installed without interfering with the work of the other Contractors.

When it is necessary during the progress of construction that a temporary electrical facility installed under this Division interferes with construction operations, the General Contractor shall relocate the temporary electrical facilities to maintain temporary power as required at no additional cost to the Owner. The General Contractor shall be responsible at all times for any damage or injury to equipment, materials, or personnel caused by improperly protected or installed temporary installations and equipment.

Within thirty days of completion of the work requiring permits for temporary services or facilities, copies of all permit close-out documentation shall be provided to the Owner. Each pay application shall include all permit close-out documentation associated with the pay application period being considered.

3. The various Contractors doing the work at the site shall be permitted to connect into the temporary general lighting system small hand tools, such as drills, hammers, and grinders, provided that:
 - a. Equipment and tools are suitable for 120 V, single phase, 60 Hz operation and operating input does not exceed 1,500 volt-amperes.
 - b. Tools are connected to outlets of the system with only one (1) unit connected to a single outlet.
 - c. In case of overloading of circuits, the General Contractor will restrict use of equipment and tools as required for correct loading.
4. The General Contractor shall keep the temporary general lighting and power systems energized fifteen minutes before the time that the earliest trade starts in the morning and de-energized fifteen minutes after the time the latest trade stops. This applies to all weekdays, Monday through Friday, inclusive, which are established as regular working days.

Any Contractor requiring temporary light and power before or after the hours set forth hereinbefore, or on a Saturday, Sunday, or holiday, shall pay for the additional cost of keeping the system energized and repaired. If more than one Contractor is involved, the charges shall be prorated, such amounts to be determined from the meter readings or other acceptable means previously agreed upon by the Contractors involved. If it is necessary for any Contractor or his employees to be in any structure after regular working hours and the temporary general lighting system is not required for illumination, that Contractor shall provide such illumination required by means of flashlights, electric lanterns, or other devices not requiring use of electricity from the temporary general lighting system.

5. Each Contractor requiring additional power and lighting other than that specified herein (including power for temporary heating equipment to be provided by the

General Contractor) shall furnish his own service complete with all fuses, cutouts, wiring and other material and equipment necessary for a complete system between the service point and the additional power consumers and shall install his own metering equipment in accordance with the requirements of the servicing power company.

6. The temporary general lighting system shall be installed progressively in structures as the various areas are enclosed or as lighting becomes necessary because of partial enclosure. Lighting intensities shall be not less than 10 foot candles.
7. The General Contractor shall provide a separate temporary night lighting circuit for construction security. This system shall be energized at the end of each normal working day and de-energized at the start of each normal working day by the General Contractor. The system is to be left energized over Saturdays, Sundays, and all holidays. Lighting intensities shall be not less than 2 foot candles.
8. Electrical welders provided by each trade used in the erection and fabrication of the buildings, structures and equipment shall be provided with an independent grounding cable connected directly to the structure on which the weld is being made rather than adjacent conduit piping, etc.

Electricians and other tradesmen necessary for the required connections and operation of welding equipment and generator, standby generators and similar equipment shall be furnished by the individual Contractors. All costs for such labor and equipment shall be borne by the individual Contractors.

9. Upon completion of the work, but prior to acceptance by the Owner, the General Contractor shall remove all temporary services, security lighting systems, temporary general lighting systems and all temporary electrical work from the premises.

G. Temporary Heating

1. The General Contractor shall provide temporary heating, ventilation coverings and enclosures necessary to properly protect all work and materials against damage by dampness and cold, to dry out the work and to facilitate work in all structures.
2. The equipment, fuel, materials, operating personnel and methods used shall be at all times satisfactory and adequate to maintain critical installation temperatures and ventilation for all work in those areas where the same is required.
3. After any structure is enclosed, the minimum temperature to be maintained is 50°F, unless otherwise specified, where work is actually being performed.
4. Before and during the application of interior finishing, painting, etc., the General Contractor shall provide sufficient heat to maintain a temperature of not less than 65°F.
5. Any work damaged by dampness or insufficient or abnormal heating shall be replaced by the General Contractor at no additional cost to the Owner.

H. Temporary Sanitary Service

1. Sanitary conveniences, in sufficient numbers, for the use of all persons employed on the work and properly screened from public observation, shall be provided and maintained at suitable locations by the General Contractor, all as prescribed by State Labor Regulations and local ordinances. The contents of same shall be removed and disposed of in a manner consistent with local and state regulations, as the occasion requires. Each Contractor shall rigorously prohibit the committing of nuisances within, on, or about the work. Sanitary facilities shall be removed from the site when no longer required.

I. Temporary Water

1. The General Contractor shall provide temporary water service for construction purposes, sanitary facilities, fire protection, field offices and for cleaning. The Contractor shall make all arrangements for connections to the potable water at the plant site.

The Contractor shall pay all charges associated with the connection and all charges for potable water used under this Contract.
2. Each Contractor shall supply potable water for his employees either by portable containers or bottled water.
3. An adequate number of hose bibbs, hoses, and watertight barrels shall be provided for the distribution of water.
4. Water service shall be protected from freezing and the service shall be extended and relocated as necessary to meet temporary water requirements.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 52 00

FIELD OFFICES, EQUIPMENT AND SERVICES

PART 1 – GENERAL

1.01 SCOPE

- A. The work under this Section shall include the providing of separate field offices for the Engineer and Contractor and a Project Sign for the site. The work shall include providing the field offices, located conveniently near the Project site, site preparation, utilities, removal of the office(s) and restoration of the area. All field offices shall be non-smoking and shall be provided with signage stating "USE OF TOBACCO PRODUCTS PROHIBITED."
- B. The Contractor shall be responsible for obtaining applicable building permits for all temporary facilities.
- C. The Contractor shall furnish, install and maintain storage and work sheds needed for construction.
- D. Owner's/Engineers field office, including all office interior furnishings, supplies, and services and utilities shall be provided by the Contractor.
- E. At completion of the Project, the Contractor shall remove temporary offices and restore the area.

1.02 REQUIREMENTS

A. General

- 1. The materials, equipment, and furnishings provided under this Section shall be new (except as indicated otherwise), serviceable, and adequate for the required purpose, and must not violate applicable codes or regulations.
- 2. The Contractor shall make all provisions and pay all costs for installation, utilities, rent, permit fees, site work and removal for field offices and facilities.

B. Construction

- 1. Structurally sound, weather tight, with floors raised above ground.
- 2. Temperature Transmission Resistance: Compatible with occupancy and storage requirements.
- 3. At the Contractor's option, portable or mobile buildings may be used.
 - a. Mobile trailers shall be Class "A", new and modified for office use. If used trailer is proposed, it must be approved by Engineer.

- b. Do not use mobile trailers for living quarters.

1.03 SUBMITTALS

- A. Administrative Submittals: Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
- B. Shop Drawings
 - 1. Temporary Utility Submittals: Electric power supply and distribution plans.
 - 2. Temporary Construction Submittals:
 - a. Contractor's field office, storage yard, parking area, and storage building plans, including gravel surfaced area.
 - b. Owner's/Engineer's field office and parking area site plan, field office floor plan and schematic drawings showing the complete telephone and data systems, including location of jacks, hubs, ports, etc. to be installed.
 - c. Staging area location plan.
 - d. Wiring diagram of the network system as specified herein.
 - 3. Project Sign, Engineer's Field Office Sign and Contractor's Field Office Sign.

1.04 MOBILIZATION

- A. Mobilization shall include, but not be limited to, these principal items:
 - 1. Obtaining required permits.
 - 2. Moving Contractor's field office and equipment required for first month operations onto site.
 - 3. Moving Owner's/Engineer's field offices and equipment onto site, and setting up for use.
 - 4. Installing temporary construction power, wiring, and lighting facilities.
 - 5. Providing onsite communication facilities, including telephones and high-speed internet connections. Contractor shall pay for internet service for the duration of the project for both the Contractor's and Owner's/Engineer's Field Offices.
 - 6. Providing onsite sanitary facilities and potable water facilities as specified and as required by applicable local, state, and federal regulations.
 - 7. Arranging for and erection of Contractor's work and storage yard.
 - 8. Posting OSHA required signage, notices and establishing safety programs and procedures.

9. Posting Owner's required signage.
10. Having Contractor's superintendent at site full time.

B. Contractor's Temporary Facilities:

1. Use area(s) designated for Contractor's temporary facilities as shown on Drawings.
2. Designated areas may or may not provide adequate space for Contractor's needs. Contractor shall make its own determination in this matter. If the designated areas are inadequate, then Contractor shall provide lands and access thereto as required for such uses.

1.05 PROTECTION OF WORK AND PROPERTY

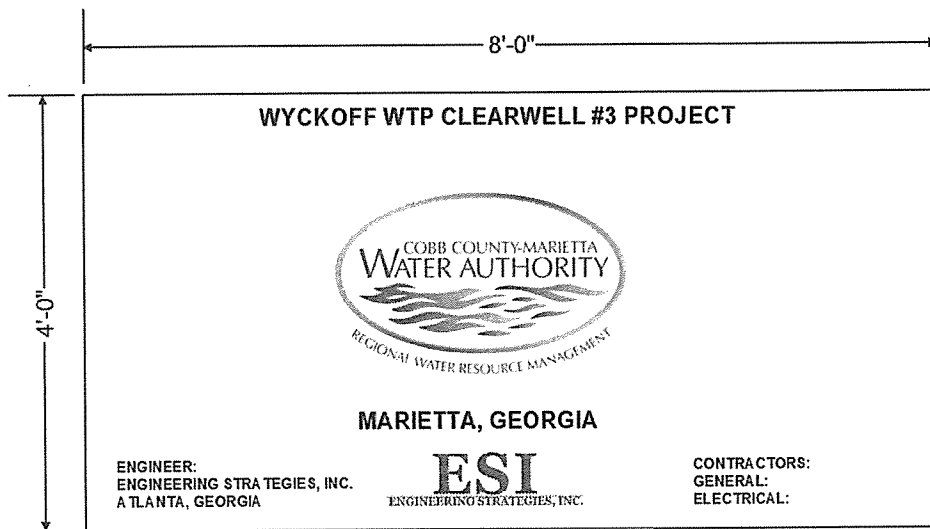
- A. Comply with Owner's safety rules while on Owner's property.
- B. Keep Owner informed of serious onsite accidents and related claims.

PART 2 – PRODUCTS

2.01 Project Sign and Sign Panel

1. The General Contractor shall erect a sign at the Project site identifying the Project. **The sign shall be erected within twenty-one (21) days after the Notice to Proceed**, and shall be in accordance with the Specifications and details included in this Section. The project sign and sign panel shall be furnished, erected, and maintained by the Contractor at the location designated by the Engineer. Wording and colors shall be as shown on the detail after the end of this Section. The Contractor shall submit a scale drawing of the sign to the Engineer for approval prior to its assembly.
2. The project sign shall be fabricated, erected and maintained by the Contractor in accordance with the following specifications:
 - a) Sign Panel: The sign panel shall be constructed of 3/4-inch minimum thickness marine plywood rabbeted into a 2 inch x 4 inch wood frame. All fasteners used in the construction of the sign shall be of a rustproof nature.
 - b) Painting: All supports, trim and back of the sign panel shall be painted with at least two (2) coats of the same paint used for the sign face. All paint used shall be exterior grade paint, suitable for use on wood signs.
 - c) Sign Supports: The supports for the project sign shall be at least two 4" by 4" treated wood posts. The sign panel shall be securely fastened to the sign supports with at least six (6) 3/8" ϕ galvanized bolts, nuts and washers. The positioning and alignment of the sign shall be as determined by the Engineer.

- d) Maintenance: The project sign shall be maintained by the Contractor, in good condition, at all times, for the duration of construction.
- e) Removal of Sign from Project Site: The removal of the project sign from the construction site by the Contractor shall be at the completion of construction, when ordered by the Engineer.
- f) Payment: The cost of the fabrication, erection, maintenance, and removal of the project sign, including all labor and materials, shall be included in the General Contractor's Lump Sum Bid. No extra payment will be made for obliterating certain names and offices and replacement thereof of others because of administrative changes during the course of this Contract.
- g) The sign should be generally configured as follows:



1. Provide black letters on white background.
2. Use of 1/8" durably signboard with vinyl lettering will be acceptable as an alternate to plywood and painted letters.

2.02 ENGINEER'S FIELD OFFICE

- A. The office shall be fully installed, including all equipment and services, and available for Owner's/Engineer's use immediately following the Notice to Proceed and prior to start of the Work at site, to remain on the site for minimum of thirty (30) days after substantial completion of the Work.
- B. The Engineer's Field Office shall be separate from the Contractor's Field Office. A 24-inch by 36-inch marine plywood sign shall be erected on the outside wall of the Engineer's field office in a location determined by the Engineer. The sign shall be painted with at least two coats of exterior grade paint, white background with dark blue, 3-inch high lettering, neatly arranged, with company logo added as follows:

FIELD OFFICE



- C. A 24-inch by 36-inch marine plywood sign shall be erected on the outside wall of the Contractor's field office in a location determined by the Engineer. The sign shall be painted with at least two coats of exterior grade paint, white background with contrasting color, 3-inch high lettering, neatly arranged, with company name and/or logo.

- D. The Engineer Field Office shall have, when finished, not less than 1,000 square feet of interior floor space with full height (floor to ceiling) partition walls. The office shall be divided into the following areas:
 - 1. Storage closet for consumable supplies.
 - 2. Three (3) offices (two 160 sf and the other with 120 sf minimum each).
 - 3. One (1) conference room area (550 sf minimum).
 - 4. One (1) file/plan room area (200 sf minimum).
 - 5. One (1) restroom facility (totally enclosed water closet and lavatory, 100 sf minimum).
 - 6. The Engineer's Field Office shall be one (1) pre-fabricated building or one (1) mobile trailer having ceiling, floor and walls adequately insulated. The office shall be properly skirted as approved by the Engineer. The office shall have an outside main entrance. Main entrance to office shall have a 72-square foot minimum covered porch with a separate roof and rainproof seal to the main structure. The outside main entrance shall have a keyed lockable door with "non-slip" steps (four feet wide) and handrails down to grade. A concrete pad at least 4 feet by 4 feet shall be installed at the bottom of the stairs with a two-foot wide concrete sidewalk at least 10 feet long installed outward from pad outward to a location determined by the Engineer. Additional exits from the office shall be provided with a keyed lockable door and "non-slip" steps and handrails down to grade. Furnish 5 sets of keys for exterior doors.

- E. The Engineer's Field Office shall have the following inside appurtenances:
 - 1. All interior offices shall be provided with keyed lockable doors. Furnish five sets of keys for interior doors. All windows shall be equipped with locking devices.
 - 2. Venetian blinds on all windows including outside doors.
 - 3. Operable sash and insect screens on all windows.

4. Provide one window for each office, minimum of two (2) for large areas such as conference/file room area.
- F. The Engineer's Field Office shall be adequately wired for electricity in accordance with applicable codes to handle the total lighting, air conditioning, equipment and other loads. Lighting fixtures, in adequate numbers, shall be installed to give an illumination of 150 foot candles average and minimum glare in each room. Fluorescent lamp fixtures with minimum 45 degrees shielding will be required. Provide 110 volt convenience duplex outlets, one per wall in each room shall be provided. Provide air conditioning and heating combination unit to maintain 78 degrees F inside in winter with outside air temperature of 20 degrees F and 72 degrees F inside in summer with the outside temperature of 100 degrees F.

2.03 ENGINEER'S FIELD OFFICE INTERIOR FURNISHINGS

- A. Provide new, delivered, and set-up the following items for the Engineer's Field Office: (All maintenance services, consumable supplies, furnishings, etc. shall be provided for the full duration of the Project. The Contractor shall pay for installation and all charges for the energy used).
1. In the conference room area: one (1) conference room table that is at least eight (8) ft by sixteen(16) ft; twenty (20) folding chairs with padded seats for use at conference table
 2. In the file/plan room area: three (3) four-foot high shelves, four (4) four-drawer, legal size steel filing cabinets with lock and key, and one desk (about 3-ft by 5-ft) with lockable storage drawers and swivel type armchair on rollers; sink with hot and cold water connections and drain; counter space next to sink at least six-foot long by 3 ft wide; and eight (8) extra-heavy-duty over-sized coat hooks mounted next to outside door.
 3. Plan rack, as directed or approved by the Engineer shall be located in the file/plan room. Plan table (3 ft by 6 ft) and drafting stool, installed at location directed by the Engineer. Plan table shall have an angled working surface and shelf under working surface for storage of Contract Documents.
 4. In each office: one (1) desk about three (3) ft by five (5) ft, with a desk chair of the armchair tilt/swivel type on rollers and a guest chair; one (1) bookshelf that is three (3) feet wide by four (4) feet high with four (4) internal shelves; desk lamp with dual outlets; four (4) extra-heavy-duty over-sized coat hooks; and one (1) four-drawer, legal size, metal filing cabinet with key/lock. In the larger offices: one (4) ft by (8) ft folding table and four (4) padded folding chairs.
 5. Four (4) 36"x48" dry-erase white boards, each provided with eraser and five (5) different colored markers. Install one (1) in each office and one in the conference room as directed by the Engineer.
 6. One (1) phone for conference/file room, each office and the file/plan room. The phones shall be equipped with a speaker to allow conference calls during group meetings.

8. Wall-mounted fire extinguishers of at least 4-lb capacity for every 600 sf of floor space.
 9. Provide water cooler and water services on a weekly basis throughout the duration of the Project.
 10. Refrigerator with self-defrosting freezer and automatic ice maker connected to the trailer's water supply with filter. Unit shall be eighteen (18) cu. ft. minimum.
 11. Microwave, latest model, GE Model JES1456DS2BB or approved equal.
 12. Automatic coffee maker with two warming burners and 2 pots.
 13. Large and small disposable coffee cups, paper towels, hand sanitizer, air freshener for restroom, liquid soap, and toilet paper; each with suitable dispenser or holder.
 14. Metal waste baskets for each desk, conference room, and file/plan room and appropriately sized plastic trash bags. Provide one large (13-gal) waste basket for file/plan room and appropriately sized plastic trash bags.
 15. Broom and dustpan.
 16. First aid cabinet with supplies, including sunscreen (SPF 30 or higher) provided in both spray and lotion form. First Aid Cabinet shall conform to the OSHA requirements for an office of up to 5 persons.
 17. One laser scanner/printer/color copying machine with supplies and service for the duration of the Project. Latest model, Canon, C5240A or approved equal. Machine shall be capable of scanning/printing/copying 8.5"x11", 8.5"x14" and 11"x17" paper sizes. Copy/print rate shall be at least forty (40) copies per minute for 8.5"x11" paper size. Laser scanner/printer/copying machine listed above to be connected only to the computers provided in the Engineers Field office. The machine shall be located in the file/plan room.
 18. Outdoor minimum-maximum thermometer with range of -40 deg. F to +120 deg. F and reset provisions. Provide rain gauge.
 19. Provide data connections with high speed internet service for each office, one in the file/plan room and two (2) in the conference room. Data connections shall allow for all Engineer's Field Office computers to print to and receive scans from all office printers and plotters.
- B. Services and supplies to be supplied for the duration of the Project (in addition to utility services):
1. Repair and clean the offices, decks, parking areas and access routes.
 2. Maintain trailers (e.g., change filters quarterly, replace burned-out light bulbs, clean exterior of trailer to remove bugs and debris, make all repairs as may be required).

3. Provide complete janitorial services and supplies, including but not limited to toilet paper, soap, and paper towels. Cleaning shall be done at least three times per week other than normal working hours and include trash removal cleaning of floors and restroom.
 4. Provide one (1) covered outdoor trash bin to be emptied weekly. Provide one (1) bin for recycled materials to be emptied weekly and taken to recycling center.
 5. Provide standard office supplies including copier paper (8.5"x11" and 11"x17", 20 pound bond paper), plotter paper, printer/plotter toner, writeable CD's, CD jewel cases, file folders, file folder tabs, manila folders, pens, , dry erase markers, mechanical and colored pencils, paper/binder clips, rubber bands, highlighters, binders, Post It notes, one stapler for each office and for the conference room (Swingline Silver Optima Jam Free Desk Stapler or approved equal), extra heavy duty staples (Swingline Optima JamFree Staples or approved equal), white out, scotch tape, coffee supplies (filters, coffee, sugar, Splenda or approved equal sweetener, disposable cups), waste basket trash bags, first aid kit supplies and sunscreen, refrigerator filters, water cooler water, shipping envelopes – various sizes, outdoor boot brush, plunger, four (4) clip-boards with covers, date stamp, and four (4) pairs of scissors.
- C. Provide eight (8) safety hard hats, twenty (20) pairs of eye protection/safety glasses, and twenty (20) pairs of safety work gloves.
- 2.04 CONTRACTOR'S FIELD OFFICE AND FACILITIES
- A. The Contractor shall maintain an on-site office with a telephone and high-speed internet to fully support the construction project and shall have a responsible representative on call at all times.
 - B. Weather equipment as required to accurately record on Daily Reports temperature high/low and precipitation.
- 2.05 UTILITIES
- A. General: Provide and pay all costs for all telephone, internet, network, water, sewer, and electricity required for all of the field offices for the duration of the Project. Upon completion of the Work, remove all temporary utilities and telephone equipment.
 - B. Temporary Water and Sewer: Furnish and install all necessary temporary piping and appurtenances for water and sewer service required for field offices, including heat tracing of water pipes.
 - C. Temporary Electricity: The Contractor shall furnish and install all necessary electrical service for field offices. A standby electrical generator properly sized to handle the full connected electrical load of the trailer unit shall be provided at the initiation of the Project, as necessary, until permanent power can be established to the trailer.

D. Telephone Service:

1. The Contractor shall provide telephone service to Contractor's office and separate services to the Engineer's field office. Use of a common telephone system to serve the Contractor and Engineer will not be acceptable. All portions of the communication system shall be maintained in good working condition. At least one phone jack shall be provided in each office and open area.
2. The telephone system in the Engineer's field office shall be, in addition to Internet connection solution, a touch-tone, local to the site area code.
3. All costs for the installation costs of lines, line extensions, service charges and recurring service charges for telephone services, including long distance phone calls, shall be paid by the Contractor at no additional cost to the Owner.

E. Internet Service:

1. Internet Service Provider (ISP): The Contractor shall make arrangements and pay for dedicated minimum 100 MBPS or better Internet services to the Engineer's field office and to the Contractor's field offices for the full duration of the Project. Internet service, connections and network shall not be shared between the Owner/Engineer and the Contractor.
2. Acceptable solutions include DSL or cable. Regardless of the service provided, the Contractor shall pay all cost for, shall provide and coordinate the installation of all hardware and software necessary to provide a complete Internet access, at the required speed, and local area network, for the full duration of the Project. The Contractor shall provide and pay all cost associates with a single source vendor to furnish unit responsibility for the entire system to include, but not limited to hardware, software, ISP service, and local area network. Maintenance and support services shall be provided 24/7 for the full duration of the Project.

F. Network:

1. The Contractor shall provide a complete network system (some components may be provided by internet service provider) for each field office, including but not limited to, the following:
 - a. Linksys Cable/DSL router address translator, model #BEFSR41 or most recent equivalent at time of installation.
 - b. 2.4 GHz Wireless router conforming to IEEE 802.11b,g,n (draft 2.0) with DoS attack prevention, Firewall protection. Access Point operational mode, WPS, SPI, DHCP support, SSID authentication, 128-bit WEP encryption. Provide any and all software necessary for configuration. Security key to be configured by the Engineer.
 - c. Category 6 24-port patch panel.
 - d. Category 6 24-port Ethernet switch.

- e. Category 6 network connection in each office, conference room, and file/plan room. Provide one data connection for each office and two in conference room for personal laptops not furnished by Contractor.
 - f. Category 6 wiring to all connections and taken back to central location and terminated at the CAT-6 patch panel, as listed above.
 - g. A common electronic storage space on a Contractor furnished computer accessible by both Contractor laptops and personal laptops not furnished by Contractor.
 - h. All data ports shall be numbered. All communications wiring shall be labeled with port number from patch panel and data port number. A wiring diagram shall be provided within one week of installation of the network system.
 - i. All network systems shall be on a network board and Owner shall approve location of network board prior to installation.
2. Installation and maintenance of the network shall be performed by the Contractor at no additional cost to the Owner.

2.06 PARKING FACILITIES

- A. Parking facilities for the Contractor's field office shall be the Contractor's responsibility. The storage and work facilities provided by the Owner will not be used for parking.
- B. The Contractor shall provide ample parking for at least ten (10) cars of the Owner/Engineer, not including Contractor's vehicles. This area shall be paved or have a minimum four-inch deep graveled or crushed rock base, and be adjacent to the Engineer's field office with signage for each Owner/Engineer parking space. Gravel or crushed stone base shall be placed over a geotextile fabric placed over the subgrade. Keep area free of weeds, grass and mud. Adequate parking space shall be provided

2.07 USE OF PERMANENT FACILITIES

- A. Permanent facilities shall not be used for field offices or for storage.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Construct temporary field offices and storage facilities on proper foundations and provide connections for utility services.
 - 1. Secure portable or mobile buildings when used.
 - 2. Provide steps and landings at entrance doors.
 - 3. Provide tie-downs for 100 mile per hour gusts and winds.
 - 4. Provide proper surface drainage.

- B. Locate construction office facilities at locations within the Project area on the Owner's property as approved by the Engineer.

3.03 MAINTENANCE AND CLEANING

- A. Provide regular maintenance and cleaning for temporary structures, furnishings, equipment and services.

3.04 REMOVAL

- A. Remove temporary field offices and utilities at Project Completion or as directed by the Engineer.
- B. Remove foundations and debris; grade site to required elevations and clean areas. At a minimum, unless specified elsewhere, restore area to the condition it was in at the beginning of the project and re-grass/re-stone as required.
- C. Furnishings furnished for the Engineer's Field Office are to remain property of the Owner. Remove and relocate furnishings to a location identified by the Owner, as directed by the Engineer.

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SECTION 01 56 17

DUST CONTROL & PROPERTY PROTECTION

PART 1 – GENERAL

1.01 DUST CONTROL

- A. 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.

1.02 PROTECTION OF ADJACENT PROPERTY

- A. The bidders shall visit the site and note the buildings, landscaping, roads, parking 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 his operations.

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SECTION 01 57 13

TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 WORK OF THIS SECTION

- A. This section covers work necessary for stabilization of soil to prevent erosion before, during and after construction and land disturbing activities. The work shall include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified and as indicated on the approved Drawings. This shall include installation, maintenance, and final removal of all temporary soil erosion and sediment control measures and installation of permanent soil erosion control practices.
- B. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. The right is reserved to modify the use, location, and quantities of soil erosion and sediment control measures based on activities of the Contractor and as the Engineer considers to be in the best interest of the Owner.
- C. The Contractor shall be responsible for submitting the Notice of Intent (NOI) and the Notice of Termination (NOT) in accordance with the General NPDES Permit for Stormwater Discharges Associated with Construction Activities.
- D. The Contractor shall be responsible for paying the NPDES General Permit Fee of \$80.00 per disturbed acre to Georgia EPD and Cobb County and any other fees imposed by Cobb County.
- E. When a Construction Monitoring Program (CMP) is provided in the Contract Documents, the Contractor shall follow the practices and requirements described in the CMP.
- F. When a Stormwater Pollution Prevention Plan (SWP3) is provided in the Contract Documents, the Contractor shall follow the practices described in the SWP3.
- G. See additional information noted on the Drawings.
- H. Erosion and sediment control practices shall comply with the "Manual for Erosion and Sediment Control in Georgia," latest edition.

1.02 DEFINITIONS

- A. BMP: Best management practice. Means schedule of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, and waste disposal.

- B. Certified Contractor: A person who has received training and is a certified professional to install/construct, inspect and maintain erosion and sediment control practices.
- C. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.
- D. Construction Exit: A stone stabilized pad located at any point where traffic will be leaving a construction site to a public right-of-way, street, alley, sidewalk, or parking area or any other area where there is a transition from bare soil to a paved area.
- E. ESC: Erosion and sediment control. Any temporary or permanent measures that prevent or reduce erosion, control sedimentation, and ensure that sediment does not leave a site.
- F. Land Disturbing Activity: Any activity that results in a change in the existing soil cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to demolition, construction, clearing, grading, excavation and filling.
- G. Maintenance Period: Maintenance period begins immediately after each area is planted and shall continue for a period of 8 weeks after all seeding, sodding, and planting are completed.
- H. Project Limits: Areas, as shown or specified, within which Work is to be performed.
- I. Sediments: Soil, sand, and minerals washed from land into water, usually after a rain event.
- J. Standard Specifications: When referenced in this section, shall mean the current edition of the State of Georgia, Department of Transportation, Standard Specifications for Construction of Transportation Systems. When reference is made to a specific part of the Standard Specifications, such applicable part shall be considered as part of this section of the Specifications. In case of a conflict in the requirements of the Standard Specifications and the requirements stated herein, the most stringent requirements shall prevail.

1.03 GENERAL

- A. All activities shall conform to the "Manual for Erosion and Sediment Control in Georgia," latest edition and the Drawings. In the event of a conflict, the more stringent requirement shall apply.
- B. Contractor shall prepare and submit the NOI to Georgia EPD 14 days prior to beginning any construction activities.
- C. Land disturbance activities shall not commence until the Land Disturbance Permit has been issued and the NOI has been submitted and approved.

- D. The escape of sediment from the site shall be prevented by the installation of Erosion and Sediment Control measures and practices prior to, and concurrent with land disturbing activities for the entire duration of the project.
- E. Erosion and sediment control practices shall be installed prior to commencement of land disturbance activities.
- F. Soil erosion stabilization and sedimentation control consist of, but is not limited to, the following elements:
 - 1. Conducting earthwork and excavation activities in such a manner to fit the topography soil type and condition.
 - 2. Implementation and continuous maintenance of BMP's.
 - 3. Minimize disturbed area and duration of exposure to erosion elements.
 - 4. Stabilize disturbed areas immediately:
 - a. Topsoil and seeding:
 - 1) Placement and maintenance of Temporary Seeding on all areas disturbed by construction.
 - 2) Placement of permanent topsoil, fertilizer, and seed, etc., in all areas not occupied by structures or pavement, unless shown otherwise.
 - b. Soil Stabilization Seeding: Placement of fertilizer and seed, etc., in areas as specified hereinafter.
 - 5. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary.
 - 6. Construction of new permanent and temporary storm drainage piping and channel systems, as necessary.
 - 7. Construction or installation of temporary erosion control facilities such as inlet sediment traps, silt fences, check dams, diversion dikes, construction exit, etc.
 - 8. Construction or installation of permanent erosion control facilities such as check dams, channel stabilization, rip-rap outlet protection, permanent vegetation, etc.
- G. Contractor shall install and add to the erosion control measures as determined by the Engineer, Owner, United States Army Corps of Engineers, or the County.
- H. The Contractor shall be responsible for phasing Work in areas allocated for his exclusive use during this Project, including any proposed stockpile areas, to restrict sediment

transport. This will include installation of any temporary erosion control devices, ditches, or other facilities.

- I. The areas set aside for the Contractor's use during the Project may be temporarily developed to provide satisfactory working, staging, and administrative areas for his exclusive use. Preparation of these areas shall be in accordance with other requirements contained within these Specifications and shall both be done in a manner to control all sediment transport away from the area.
- J. Contractor is responsible for maintaining all erosion control measures installed for the full duration of this Contract.
- K. Contractor shall observe the approved Project sequence. The Contractor shall maintain careful scheduling and performance to ensure that the exposure of land area stripped of its natural cover is kept to a minimum.
- L. Prior to commencing land disturbance activities, the Contractor shall clearly and accurately demarcate the limits of land disturbance with clearing fence or other appropriate means, for the entire duration of the Project.
- M. No land disturbance shall occur outside the approved limits indicated in the approved Drawings.
- N. After installation of the initial erosion and sediment control measures, the Contractor shall schedule an inspection with the Engineer and the County's site inspector. No other construction activities shall occur until the Engineer approves the installation of the initial erosion and sediment control measures. If unforeseen conditions exist in the field that warrants the installation of additional erosion and sediment control measures, the Contractor must install any additional measures deemed necessary by the Engineer.
- O. The location of some erosion and sediment control measures may have to be altered from those shown on the approved Drawings if drainage patterns during construction differ from the ones shown on the Drawings. Contractor is responsible to accomplish erosion and sediment control for all drainage patterns created during various stages of construction. Contractor shall report to the Engineer any difficulty in controlling erosion during any phase of construction.
- P. Mulch or temporary seeding shall be applied to all disturbed areas within 7 days of clearing. All disturbed areas that are stabilized with mulch shall be stabilized with temporary seeding after 30 days.
- Q. Areas opened by construction operations and that are not anticipated to be re excavated or dressed and received final grassing treatment within 30 days shall be temporary seeded with a quick growing grass species which will provide an early cover during the season in which it is planted and will not compete with the permanent grassing.
- R. Earthwork operations in the vicinity of stream buffers shall be carefully controlled to avoid dumping or sloughing into the buffer.

- S. Inlet sediment protection shall be installed on all stormwater structures as they are constructed and as shown on the Drawings. Sediment shall not be washed into inlets.
- T. Upon completion of construction, the Contractor shall remove all temporary erosion control measures and dispose of them, unless noted on the Drawings. Permanent seeding shall be applied to the entire Site for all remaining area.
- U. The Contractor shall maintain all elements of the Soil Erosion Stabilization and Sedimentation Control systems and facilities to be constructed during this Project for the duration of his activities on this Project until permanent stabilization of the Site is achieved.
- V. Contractor shall inspect erosion and sediment control measures each day to ensure that they are working properly. Formal inspections made jointly by the Contractor and the Engineer shall be conducted, at a minimum, every 2 weeks to evaluate the Contractor's conformance to the requirements of these Specifications and the Manual for Erosion and Sediment Control in Georgia.
- W. All silt traps shall be cleaned of collected sediment after every storm event, and shall be immediately repaired or replaced if found to be defective. Cleaning shall be done in a manner that will not direct the sediment into the storm drain piping system. Removed sediment shall be taken to an area selected by the Engineer where it can be cleaned of sticks and debris, then allowed to dry. Final sediment and debris disposal shall be onsite as designated by Engineer.
- X. Silt fence shall be inspected for depth of sediment, tears, to see if fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Built up sediment shall be removed from silt fence when it has reached one-half the height of the fence.
- Y. Sediment shall be removed from the retrofitted ponds when one-third of the sediment storage capacity has been reached.
- Z. Temporary and permanent seeding and planting shall be inspected for bare spots, washouts, and healthy growth. All the permanent seeded grass cover areas shall be reworked and reseeded if 75 percent grass cover is not achieved within 14 days.
- AA. If full implementation of the approved Drawings does not provide for effective erosion and sediment control, additional measures shall be implemented as directed by the Engineer.
- BB. Contractor's failure to install, operate and maintain all erosion and sediment control measures, to the satisfaction of the Engineer, will result in all construction being stopped on the job until such measures are installed or returned to their proper functional condition.
- CC. A maintenance inspection report shall be made after each inspection by the Contractor. The reports will be kept onsite during construction and available upon request by the Owner, the Engineer, the County, or any Federal or Local Agency approving erosion and sediment control plans. This report shall be made and retained as part of the Stormwater Pollution Prevention Plan for at least 3 years from the date that the site is finally stabilized

and the Notice of Termination is submitted. The report shall identify any incidents of non-compliance.

DD. At the end of the Project, Contractor shall submit the Notice of Termination (NOT) to the Georgia EPD in accordance with the NPDES Stormwater Permit once proper permanent vegetation has been established, as approved by the Engineer and Owner, and all temporary soil erosion and sediment control measures have been removed.

1.04 SUBMITTALS

A. Submittals shall be made in accordance with Section 01 33 00:

1. Shop Drawings.
2. Product Data.
3. Samples.

B. In addition, the Contractor shall provide the following specific information:

1. Erosion and Sediment Control Plans identifying any field changes.
2. Supporting calculations from any deviation from the approved ESC plans.
3. Sequence and schedule of activities; such as ESC installation, ESC maintenance, site clearing, grading, construction activities, construction of utilities, infrastructure and buildings, final grading, and temporary and final stabilization and removal of all ESC measures.
4. Schedule shall identify the expected date and duration of each activity.
5. Copy of Land Disturbance Permit.
6. Copy of accepted NOI.
7. Copy of NPDES Permit Fee receipt.
8. Copy of NOT.

PART 2 - PRODUCTS

2.01 SILT FENCE

A. Type-C silt fence in accordance with the "Manual for Erosion and Sediment Control in Georgia," latest edition and Section 171 of the Department of Transportation, State of Georgia, Standard Specifications, latest edition.

2.02 PERMANENT SEED

- A. As specified on the "Vegetative Covers" schedule shown in the ESC plans.

2.03 TEMPORARY SEED

- A. As specified on the "Vegetative Covers" schedule shown in the ESC plans.

2.04 TOPSOIL

- A. Topsoil shall be a loam, sandy loam, clay loam, silt loam, sandy clay loam, or loamy sand. Topsoil removed from the construction area may be stockpiled and reused or topsoil may be obtained from approved borrow areas.

2.05 FERTILIZER

- A. As specified on the "Vegetative Covers" schedule shown in the ESC plans.

2.06 LIME

- A. As specified in Section 32 92 00, Grassing and Mulching.

2.07 MULCH

- A. As specified in Section 32 92 00, Grassing and Mulching.

2.08 RIPRAP

- A. As specified in Section 31 37 00, Riprap.

2.09 EROSION CONTROL MATTING

- A. As specified in Section 31 32 00, Soil Stabilization.

2.10 TACKIFIER

- A. As specified in Section 31 32 00, Soil Stabilization.

2.11 TREE PROTECTION FENCE

- A. Ultraviolet stabilized polyethylene or polypropylene safety fence, 3 feet in height, and yellow or orange in color.

2.12 GEOTEXTILES

- A. As specified in Section 31 32 19.16, Geotextile.

2.13 WATER FOR DUST CONTROL

- A. Free of hazardous or toxic contaminants.

2.14 STONE FOR CONSTRUCTION EXIT

- A. Crushed stone with particle size ranging from 1.5 to 3.5 inches.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor shall install erosion and sediment control measures and maintain in accordance with the Drawings. The sequence of construction shown on the Drawings is made a part of these Contract Documents.
- B. The Contractor shall provide and maintain soil stabilization at all times.
- C. After installation of the initial erosion and sediment control measures, the Contractor shall schedule an inspection with the Engineer and the Owner's site inspector. No other construction activities shall occur until the Engineer approves the installation of the initial erosion and sediment control measures. If unforeseen conditions exist in the field that warrants the installation of additional erosion and sediment control measures, the Contractor must install any additional measures deemed necessary by the Engineer.
- D. Contractor shall observe the approved Project sequence. The Contractor shall maintain careful scheduling and performance to ensure that the exposure of land area stripped of its natural cover is kept to a minimum.
- E. Inlet sediment protection shall be installed on all existing and proposed stormdrain structures as shown on the Plans. Sediment shall not be washed into inlets.

3.02 SILT FENCE

- A. The Contractor shall construct silt fence Type-C in accordance with the "Manual for Erosion and Sediment Control in Georgia," latest edition.

3.03 SEEDING

- A. General:
 - 1. The Contractor shall give at least 3 days notice to the Engineer prior to seeding to allow for inspection of the areas. The Contractor shall rework any areas not approved for seeding to the Engineer's satisfaction.
 - 2. The Contractor shall keep the Engineer advised of schedule of operations.
 - 3. Seed shall be clean, delivered in original unopened packages and bearing an analysis of the contents, guaranteed 95 percent pure with minimum germination rate of 85 percent.
- B. Schedules: Seeding shall be performed in accordance with the schedules shown on the approved Drawings.

C. Soil Stabilization and Temporary Seeding:

1. Soil stabilization seeding shall consist of the application of the following materials in quantities as further described herein for stockpiles and disturbed areas left inactive for more than 14 days.
 - a. Lime.
 - b. Fertilizer.
 - c. Seed.
 - d. Mulch.
 - e. Maintenance.
2. Hydroseeding will be permitted as an alternative method of applying seed and associated soil conditioning agents described above. Should the Contractor elect to apply soil stabilization seeding by hydroseeding methods, he shall submit his operational plan and methods to the Engineer.
3. Temporary Seeding is to be placed and maintained over all disturbed areas prior to Permanent Seeding. Maintain Temporary Seeding until such time as areas are approved for Permanent Seeding. As a minimum, maintenance shall include the following:
 - a. Fix-up and reseedling of bare areas or redisturbed areas.
 - b. Mowing for stands of grass or weeds exceeding 6 inches in height.

D. Topsoil and Permanent Seeding:

1. Topsoil and Permanent Seeding shall consist of the application of the following materials in quantities as further described herein:
 - a. 4-inch depth of topsoil.
 - b. Lime.
 - c. Fertilizer.
 - d. Permanent seed mix.
 - e. Mulch.
2. Topsoil is to be placed over all disturbed areas that are not surfaced with concrete, asphalt, or pavers.

3. Preparation:
 - a. After rough grading is completed and reviewed by the Engineer, Contractor shall spread topsoil as hereinbefore specified over all areas to receive Permanent Seeding to a minimum compacted depth of 6 inches with surface elevations as shown. Loosen the finished surface to a depth of 2 inches and leave in smooth condition, free from depressions or humps, ready for seeding.
 - b. Finish Grading:
 - 1) Contractor shall rake the topsoiled area to a uniform grade, so that all areas drain as indicated on the grading plan.
 - 2) Contractor shall remove all trash and stones exceeding 1 inch in diameter from area to a depth of 2 inches.
4. Permanent Seed: After soil has been scarified, apply seed and other products at the rate and proportion specified in the "Vegetative Covers" schedule shown on the approved Drawings.
5. Maintenance:
 - a. Maintenance Period: Contractor shall begin maintenance immediately after each portion of permanent grass is planted and continue for 8 weeks after all planting is completed.
 - b. Maintenance Operations: Contractor shall water to keep surface soil moist. Repair washed out areas by filling with topsoil, liming, fertilizing, and seeding. Replace mulch on banks when washed or blown away. Mow to 2 inches after grass reaches 3 inches in height, and mow frequently enough to keep grass from exceeding 3 1/2 inches. Weed by local spot application of selective herbicide only after first planting season when grass is established.
6. Guarantee:
 - a. If, at the end of the 8-week maintenance period, a satisfactory stand of grass has not been produced, the Contractor shall renovate and reseed the grass or unsatisfactory portions thereof immediately, or, if after October 15 during the next planting season. If a satisfactory stand of grass develops by July 1 of the following year, it will be accepted. If it is not accepted, a complete replanting will be required during the planting season meeting all of the requirements specified under paragraph Permanent Seed.
 - b. A satisfactory stand is defined as grass or section of grass that has a substantial establishment of new grass, strongly rooted, and uniformly green in appearance from a distance of 50 feet and which covers 75

percent or more of the grassed area. No noticeable thin or bare areas as determined by the Engineer.

3.04 RIPRAP

- A. Install riprap protection as shown on the approved Drawings and as specified in Section 31 37 00, Riprap.

3.05 EROSION CONTROL MATTING

- A. Shall be placed after areas have been seeded and shall be installed in accordance with the manufacturer's recommendations, and the "Manual for Erosion and Sediment Control in Georgia," latest edition and as specified in Section 31 32 00, Soil Stabilization.

3.06 TACKIFIER

- A. Shall be installed in accordance with the "Manual for Erosion and Sediment Control in Georgia," latest edition and as specified in Section 31 32 00, Soil Stabilization.

3.07 GEOTEXTILES

- A. Installed where shown on the approved Drawings and as specified in Section 31 32 19.16, Geotextile.

3.08 DUST CONTROL

- A. Contractor shall control, at all times, surface and air movement of dust.
- B. Sprinkler site with water until the surface is wet. Repeat as needed.

3.09 CONSTRUCTION EXIT

- A. Construct a Construction Exit to allow for removal of mud from the tires.
- B. Provide a stone stabilized pad at location(s) shown on Approved Drawings, as follows:
 - 1. Width: 20 feet minimum.
 - 2. Length: 50 feet minimum.
 - 3. Thickness: 6 inches minimum.
- C. Provide a non-woven geotextile underliner.
- D. If the action of the vehicle traveling over the stone pad does not sufficiently remove the mud, the tires should be washed prior to entrance onto public rights-of-way.

- E. When washing is required, it shall be done on an area stabilized with crushed stone and provisions that intercept the sediment-laden runoff and direct it into an approved sediment trap or sediment basin.

3.10 STORM DRAIN INLET PROTECTION

- A. Install storm drain inlet protection around all storm drain inlets that are within 200 feet of the proposed construction to trap sediment.
- B. Filter Fabric with Supporting Frame:
 - 1. Provide silt fence with supporting frame around inlets.
 - 2. The stakes shall be spaced evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely driven into the ground, approximately 18 inches deep.
 - 3. The silt fence fabric shall be entrenched 12 inches and backfilled with crushed stone or compacted soil.
 - 4. Fabric and wire shall be securely fastened to the posts, and fabric ends must be overlapped a minimum of 18 inches or wrapped together around a post to provide a continuous fabric barrier around the inlet.
- C. Block and Gravel Block Inlet Protection:
 - 1. Install concrete blocks around the perimeter of the structure. The foundation should be excavated at least 2 inches below the crest of the storm drain.
 - 2. Place geotextile over all block openings to hold gravel in place.
 - 3. Place clean gravel around the blocks on a 2:1 slope or flatter. Gravel should be placed 2 inches below the top of the blocks.

3.11 CONCRETE WASH-DOWN

- A. Construct a concrete wash-down area for the wash-down of concrete tools, concrete mixer chutes, hoppers, and the rear of the concrete trucks as shown on the drawings.
- B. The concrete wash-down facility shall be located a minimum of 50 feet from storm drains, open ditches, or water bodies.
- C. Wash-out discharge from the cleaning of concrete trucks, tools, and other equipment shall not be discharged into storm drains, open ditches, streets, or water bodies.
- D. Excess concrete shall not be disposed of on-site. All excess concrete shall be transported off-site and disposed of properly.
- E. It is prohibited to wash out the mixing drum of the concrete truck on-site.

3.12 FIELD QUALITY

- A. Upon completion of maintenance period and on written notice from the Contractor, the Engineer will within 15 days of receipt, determine if a satisfactory stand has been established.
- B. If a satisfactory stand has not been established, the Engineer will make another determination upon written notice from Contractor following the next growing season.

3.13 MAINTENANCE OF EROSION AND SEDIMENT CONTROL MEASURES

- A. Erosion and sediment control measures shall be maintained at all times until permanent stabilization of the site is achieved.
- B. Erosion and sediment control measures shall be checked after each rain event, and shall be immediately repaired or replaced if found to be defective. A record shall be maintained of all inspections, repairs and replacement.
- C. Contractor shall inspect erosion and sediment control measures each day to ensure that they are working properly.
- D. Construction exit shall be top dressed with additional material periodically to maintain minimum depth of 6 inches. All materials spilled, dropped, washed, or tracked from vehicles or site onto roadways or into storm drains must be removed immediately.
- E. Silt fence shall be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Build up sediment shall be removed from silt fence when it has reached one-half the height of the fence.
- F. Each BMP is to be maintained or replaced if the accumulated sediment depth is equal to or greater than one-half of the capacity of the device. Reference marks denoting the elevation at which each device is to be maintained shall be placed on all devices.
- G. Temporary and permanent seeding, sodding, and planting shall be inspected for bare spots, washouts, and healthy growth. All the permanent seeded grass cover areas shall be reworked and reseeded if 75 percent grass cover is not achieved within 14 days.
- H. If full implementation of the approved Plans does not provide for effective erosion and sediment control, additional ESC measures shall be implemented as directed by the Engineer or Owner.
- I. A maintenance inspection report shall be made after each inspection by the Contractor. The reports will be kept onsite during construction and available upon request by the Engineer, Owner, or any Federal, State, or Local Agency. The report shall identify any incidents of non-compliance.
- J. Contractor shall install and add to erosion control measures as determined by the Engineer or the Owner.

- K. The Contractor shall maintain all elements of the ESC measures and facilities to be constructed during this Project for the duration of his activities on this Project. Formal inspections made jointly by the Contractor and the Engineer shall be conducted every 2 weeks to evaluate the Contractor's conformance to the Approved Drawings and this Specification.
- L. All silt traps shall be cleaned of collected sediment after every storm or as determined from the biweekly inspections. Cleaning shall be done in a manner that will not direct the sediment into the storm drain piping system. Removed sediment shall be taken to an area selected by the Engineer where it can be cleaned of sticks and debris, then allowed to dry. Final sediment and debris disposal shall be onsite as designated by Engineer.
- M. Replacement or repair of failed or overloaded silt fences, check dams, or other temporary erosion control devices shall be accomplished by the Contractor within 2 days after receiving written notice from the Engineer.
- N. Unpaved earth drainage ditches shall be regraded as needed to maintain original grade and remove sediment buildup. If a ditch becomes difficult to maintain, the Contractor shall cooperate with the Engineer and install additional erosion control devices such as check dams, temporary paving, or silt fences as directed by the Engineer.
- O. If the Contractor has not complied with any of the above maintenance efforts to the satisfaction of the Engineer within 2 working days after receiving written notification from the Engineer, the Owner shall have the prerogative of engaging others to perform any needed maintenance or cleanup, including removal of accumulated sediment at constructed erosion control facilities, at Contractor's expense.

- END OF SECTION -

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE

A. Furnish and Install

1. Where the words "furnish", "provide", "supply", "replace", or "install" are used, whether singularly or in combination, they shall mean to furnish and install, unless specifically stated otherwise.
2. In the interest of brevity, the explicit direction "to furnish and install" has sometimes been omitted in specifying materials and/or equipment herein. Unless specifically noted otherwise, it shall be understood that all equipment and/or materials specified or shown on the Drawings shall be furnished and installed under the Contract as designated on the Drawings.

B. Concrete Foundations for Equipment

1. Contractor shall provide all concrete foundations shown, specified or required for all equipment furnished under this Contract.
2. Anchor bolts and templates for equipment foundations shall be furnished under the Contract for installation by the Contractor.

1.02 EQUIPMENT AND MATERIALS

- A. All equipment, materials, instruments or devices incorporated in this project shall be new and unused, unless indicated otherwise in the Contract Documents. Equipment and materials to be incorporated into the work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.
- B. The Contractor shall protect all equipment and materials from deterioration and damage. Storage of equipment and materials shall be in locations completely protected from flooding, standing water, excessive dust, falling rock, brush fire, etc. Storage areas shall be located sufficiently distant from all construction activities and the movement of construction vehicles to minimize the potential for accidental damage. Any equipment or materials of whatever kind which may have become damaged or deteriorated from any cause shall be removed and replaced by good and satisfactory items at the Contractor's expense for both labor and materials.

1.03 INSTALLATION OF EQUIPMENT

- A. Equipment and materials shall be installed in accordance with the requirements of the General Conditions, Supplemental Conditions and the respective Specification Sections.

- B. Concrete foundations for equipment shall be of approved design and shall be adequate in size, suitable for the equipment erected thereon, properly reinforced, and tied into floor slabs by means of reinforcing bars or dowels. Foundation bolts of ample size and strength shall be provided and properly positioned by means of suitable templates and secured during placement of concrete. Foundations shall be built and bolts installed in accordance with the manufacturer's certified drawings.
- C. Before mounting equipment on a foundation, the Contractor shall clean the top surface; if necessary, rough it with a star chisel and clean again; and clean out all foundation bolt sleeves. The Contractor shall provide a sufficient number of steel plate shims about 2-inches wide and 4-inches long, and of a varying thickness from 1/8 to 1/2-inch. A combination of these shims shall be placed next to each foundation bolt to bring the bottom of the bedplate or frame about 1/8-inch above the final setting. The equipment shall be lowered by changing the combination of shims. Using brass shim stock of various thicknesses, continue to level the equipment a little at a time and in rotation until it is at the correct elevation in both directions. When the equipment is level, tighten down on the foundation bolts a little at a time in rotation to make certain the equipment remains level and does not shift on the shims. A preliminary alignment check shall be made before grout is placed.
- D. Equipment shall be set, aligned and assembled in conformance with manufacturer's drawings or instructions. Run out tolerances by dial indicator method of alignment shall be plus or minus 0.002-inches, unless otherwise approved by the Engineer.
- E. All blocking and wedging required for the proper support and leveling of equipment during installation shall be furnished by the Contractor. All temporary supports shall be removed, except steel wedges and shims, which may be left in place with the approval of the Engineer.
- F. Each piece of equipment or supporting base, bearing on concrete foundations, shall be bedded in grout. The Contractor shall provide a minimum of 1-1/2-inch thick grouting under the entire baseplate supporting each pump, motor drive unit and other equipment. Grout shall be non-shrink grout, as specified under Section 03 60 00, Grouting.

1.04 CONNECTIONS TO EQUIPMENT

- A. Connections to equipment shall follow manufacturer's recommendations as to size and arrangement of connections and/or as shown in detail on the Drawings or approved Shop Drawings. Piping connections shall be made to permit ready disconnection of equipment with minimum disturbance of adjoining piping and equipment.
- B. The Electrical Contractor shall be responsible for bringing proper electrical service to each item of equipment requiring electrical service as shown on the Drawings or approved Shop Drawings. Electrical connections to equipment requiring electrical service shall be made by the Electrical Contractor, unless otherwise indicated on the Drawings or in the Technical Specifications.

1.05 SUBSTITUTIONS

- A. Requests for substitutions of equipment or materials shall conform to the requirements of the General Conditions, Supplemental Conditions, and as hereinafter specified.
1. Contractor shall submit for each proposed substitution sufficient details, complete descriptive literature and performance data together with samples of the materials, where feasible, to enable the Owner and Engineer to determine if the proposed substitution is equal.
 2. Contractor shall submit certified tests, where applicable, by an independent laboratory attesting that the proposed substitution is equal.
 3. A list of installations where the proposed substitution is equal.
 4. Requests for substitutions shall include full information concerning differences in cost, and any savings in cost resulting from such substitutions shall be passed on to the Owner.
- B. Where the approval of a substitution requires revision or redesign of any part of the work, including that of other Contracts, all such revision and redesign, and all new drawings and details therefore, shall be provided by the Contractor at his own cost and expense, and shall be subject to the approval of the Owner and Engineer.
- C. In the event the Engineer is required to provide additional engineering services, then the Engineer's charges for such additional services shall be charged to the Contractor by the Owner in accordance with the requirements of the General Conditions, and the Supplemental Conditions.
- D. In all cases the Owner and Engineer shall be the judge as to whether a proposed substitution is to be approved. The Contractor shall abide by their decision when proposed substitute items are judged to be unacceptable and shall in such instances furnish the item specified or indicated. No substitute items shall be used in the work without written approval of the Owner and Engineer.
- E. Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Engineer in considering a substitution proposed by the Contractor or by reason of the failure of the Engineer to approve a substitution proposed by the Contractor.
- F. Acceptance of any proposed substitution shall in no way release the Contractor from any of the provisions of the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 61 00

TRANSPORTATION AND HANDLING

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The Contractor shall provide transportation of all 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. Any and all materials and products, including spare parts, 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.

1.02 TRANSPORTATION

- A. All materials shall be suitably boxed, crated or otherwise protected during transportation.
- B. Where materials will be set, placed, or installed using cranes or hoists, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the cranes or equipment.

1.03 HANDLING

- A. All materials and products, including spare parts, 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 materials shall be used in handling the equipment. 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 products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, 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.
- E. All handling, moving, lifting, transporting, and storing of materials including spare parts and other products shall be done in strict accordance with the methods recommended by the respective manufacturers.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 61 13

ASSET REGISTRY

PART 1 – GENERAL

1.01 SCOPE

- A. The Work under this section includes gathering and electronically recording financial and technical information needed to support the Owner's Fixed Asset Registry and Computerized Maintenance Management System (CMMS).

1.02 FIXED ASSETS

- A. The Contractor shall generate the financial information necessary to support the Owner's Fixed Asset Registry and submit the information on a monthly basis with each pay application, or more often as directed by the Engineer.
- B. Financial information (Purchase Price) shall be provided for the following categories of assets:
 - 1. Equipment: All equipment with a purchase value of \$2,000 or more and all equipment that has been assigned an "equipment" or "tag" number on the contract documents. The term "equipment" includes all process equipment, HVAC equipment, instrumentation, valves and gates (including actuators), tanks, electrical panels (including switchgear, MCCs, AFDs, panel boards, automatic transfer switches, heat trace panels, and the like), factory and field control panels, patch panels, control system panels (including PLC and DCS cabinets, marshalling (I/O) cabinets, etc.), roll-up doors, cranes and hoists. The asset value of the equipment shall be the Contractor's actual purchase price without installation, taxes, overheads, or mark-ups. The Contractor shall obtain a breakdown of equipment values from its vendors and suppliers, where possible, and use its best efforts to provide or estimate the actual purchase price. In addition, the Contractor shall provide an estimate of the cost of installation of each equipment item (e.g., setting, aligning, grouting, etc.).
 - 2. Structure: The cost of structures (typically those structures that require individual building permits) including all labor associated with the structure and all materials (including piping, raceway, wiring, supports, and appurtenances) incorporated into the structure. The structure cost shall include all improvements to the structure and, as applicable, the cost of demolition or other changes to the structure, as directed by the Engineer.
 - 3. Site Improvements: The cost of site improvements shall include all earthwork, manholes / handholes, culverts and drainage structures, piping, ductbank and wiring not incorporated in a structure, roads, curbs, sidewalks, grassing and landscaping, demolition, and any other improvements to the site. The site

improvements cost shall include all improvements to the site and, as applicable, the cost of demolition or other changes to the site, as directed by the Engineer.

4. Special Items: Certain portions of the construction may have a different useful life (from an accounting standpoint). An example of this is roofing on a structure. These special items, as directed by the Engineer, shall be listed separately. The Contractor shall also provide an estimate of the installation cost of the special item.
 5. General Costs: The Contractor shall provide, as a separate line item when directed by the Engineer, the contractor's general costs (general conditions, field engineering, management, supervision, overhead, profit, mobilization, demobilization, permits, bonds, insurance, etc.), associated with the Project.
- C. The Contractor shall provide the required financial information in an Excel format acceptable to the Engineer, with the cost information displayed individually, distributed, or rolled up as directed by the Engineer.
- D. Information to be included as part of fixed asset reporting shall include, as applicable:
1. Tag Number (equipment number, structure number, other unique identification number, as applicable, and as directed by the Engineer).
 2. Structure Name (for site improvements use "Site Improvements").
 3. Description (equipment description or description of asset).
 4. Manufacturer.
 5. Vendor (or supplier).
 6. Model Number.
 7. Serial Number.
 8. Purchase Price (cost as defined above).
 9. Installed Date (usually the date of Substantial Completion).
 10. Manufacturer's Estimated Life Cycle (years).
 11. Warranty Information.

1.03 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

- A. In addition to the Fixed Asset information described above, the Contractor shall collect information needed to support data input for the Owner's Computerized Maintenance Management System and submit the information periodically, as directed by the Engineer.

- B. The Contractor shall take digital photos of all equipment nameplates and electronically file the information by Structure Name and Tag Number. Data (such as serial numbers) must be collected or verified from equipment after it is in its installed location.
- C. A substantial part of the data needed for the CMMS is provided on the equipment nameplates, however, the Contractor may need to refer to submittals, operations and maintenance manuals, and/or other manufacturer information to obtain dimensions, weights, etc., that are not included on nameplates.
- D. Paragraph 1.05 below provides examples of information needed to be recorded for various types of equipment. Multiple forms may be needed for a single piece of equipment. Actual information required will be as directed by the Engineer.

1.04 INFORMATION SUBMITTALS

- A. The Contractor shall record in a Microsoft Excel spreadsheet file, the data collected for the Asset Registry and CMMS to the Owner through the Engineer.
- B. The format of a typical Asset – CMMS Spreadsheet is as shown in the first exhibit under paragraph 1.06 with each asset on a separate row and the various data fields in columns (only the first nine columns of a larger spreadsheet are shown). Due to the nature of instrumentation, a separate detailed Instrumentation Spreadsheet (which allows multiple model / serial numbers and other unique information to be associated with a single instrument) is also shown in the second exhibit under paragraph 1.06. The total cost for instrumentation from the Instrumentation Spreadsheet, in the example, is entered as a line item in the Asset – CMMS Spreadsheet.
- C. A separate Asset – CMMS Spreadsheet shall be prepared for each structure or portion of the Project, including site improvements, as directed by the Owner.
- D. To the extent available, the Contractor should obtain a list(s) of equipment as described in paragraph 1.02.B.1 above from the Owner for importation into the database or spreadsheet(s).
- E. The Contractor shall submit to the Engineer, a draft of the Asset – CMMS Spreadsheet for each structure or portion of the Project, by the 50 percent construction complete stage of the structure or portion of the Project, for review as to form and completeness of the asset list. If requested by the Engineer or Owner, the Contractor shall submit copies of the spreadsheet periodically (but no more than once a month), as a work in progress for the Engineer's and Owner's review. Failure to submit the spreadsheets, as requested by the Engineer or Owner, may result in delayed processing of the most current pay request (until the spreadsheet is submitted and accepted).
- F. The Contractor shall submit, to the Engineer, a preliminary copy of the Asset – CMMS Spreadsheet for any structure or portion of the Project a minimum of 60 days prior to the anticipated Substantial Completion date for that structure or portion of the Project, with all information complete, except for the date of Substantial Completion. The final Asset – CMMS Spreadsheet for each structure or portion of the Project shall be submitted as part of the requirement for Substantial Completion. Failure to submit the

spreadsheet as described above may result in delay in achieving Substantial Completion.

- G. At the end of the Project, all Asset – CMMS Spreadsheets pertaining to the work must be complete and have been submitted to and accepted by the Engineer in order to achieve Final Completion of the Project.

1.05 EXAMPLES OF TYPICAL DATA FOR VARIOUS TYPES OF EQUIPMENT

A. Motor Data:

- 1. Tag No., Description, Location, Manufacturer, Model, Serial No., HP, Speed, Service Factor, Insulation, Noise Level, Enclosure, Frame, Motor Type, Volts, Phase, Amps, Design Temp., Drive Type, Motor Weight (lbs), Dimensions (LxWxH) in inches, Oil Type, Oil Volume (gal), Frequency of Oil Changes (hrs).

B. Electrical Equipment:

- 1. Tag No., Description, Location, Manufacturer, Model, Serial No., Type, Volts, Amp Rating, Phase, NEMA Enclosure Rating, Source of Power, Trip Device Description, Specifics: For MCC-No. of Compartments, For Starters-Soft Start or AFD, etc.
- 2. Electrical Ductbank for 4160 V and 480 V:
 - a. Tag No., Description, Location, No. of Conduits, Size of Conduits, Cable Type, Cable Size, Number of Cables, Cable Manufacturer, Source of Power, Feeding What Equipment,

C. Diesel Generator:

- 1. Tag No., Description, Location, Engine Manufacturer, Model, Serial No., Generator Manufacturer, Model, Serial No., KW Output, Noise Level within Enclosure, Weight (lbs), Dimensions (LxWxH) in inches, Oil Type, Oil Volume (gal), Frequency of Oil Changes (hrs).

D. Battery System:

- 1. Tag No., Description, Location, Manufacturer, Model of Charger, Serial No. of Charger, Type of Batteries, Model of Batteries, No. of Batteries, Voltage of System, Amps of System, Battery Life Expectancy.

E. Roof System:

1. Tag No., Description, Location, Manufacturer, Installer, System Type, Life Expectancy.

F. HVAC Equipment:

1. Tag No., Description, Location, Manufacturer, Installer, Model, Serial No., Type (fan, heating, cooling, etc.), Volts, Amps, Source of Power, Weight (lbs), Dimensions (LxWxH) in inches.

1.06 ASSET REGISTRY CMMS SPREADSHEET EXAMPLES:

- A. Examples are provided on the two pages that follow END OF SECTION.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

A	B	C	D	E	F	G	H	I
Tag No	Structure	Equipment Description	Manufacturer	Vendor	MODEL	Serial Number	Purchase Price	Install Date
1	00 - FINE SCREENING - LIME	FSL Structure	Pizzagalli	Pizzagalli	N/A	N/A	\$0,000,000	5/25/2010
2	05 - FINE SCREENING - LIME	Instrumentation (see Invenmys details)	Various	Invenmys	N/A	N/A	\$82,200	5/25/2010
3	05 - FINE SCREENING - LIME	Standing Seam Roof	Various	Pierre	N/A	N/A	\$85,000	5/25/2010
4	06 - FINE SCREENING - LIME	Built-up Roof	Juris - Martville	Pierre	N/A	N/A	\$40,000	5/25/2010
5	06 - FINE SCREENING - LIME	Air Cooled Condenser	Liebert	Shumate	PF1067AH	N/A	\$50,000	5/25/2010
6	06 - FINE SCREENING - LIME	DX Air Handling Unit	Liebert	Shumate	BU060E	N/A	\$75,000	5/25/2010
7	06 - FINE SCREENING - LIME	Automated Transfer Switch	Fahrer	Magna	ATV3KDA3000TK-III	IAT 04380-010	\$7,400	5/25/2010
8	06 - FINE SCREENING - LIME	Fine Screen Makeup Door	ATD	ATD	Pro Q1X	100710	\$10,000	5/25/2010
9	06 - FINE SCREENING - LIME	Line Makeup Door	ATD	ATD	Pro Q1X	100710	\$10,000	5/25/2010
10	06 - FINE SCREENING - LIME	Flapair Unit Header	TPI Corporation	Shumate	P3P505T 43WDST01	N/A	\$2,000	5/25/2010
11	06 - FINE SCREENING - LIME	Electric Unit Header	TPI Corporation	Shumate	P3P505T 43WDST01	N/A	\$2,000	5/25/2010
12	06 - FINE SCREENING - LIME	HHP - airtal supply fan	Hatzell	Shumate	A35-3654-H4X-M43	1827/43	\$10,000	5/25/2010
13	06 - FINE SCREENING - LIME	Propeller wall exhaust Fan	Loren Cook	Shumate	2408A/24AB	N/A	\$5,000	5/25/2010
14	06 - FINE SCREENING - LIME	Propeller Wall exhaust Fan	Loren Cook	Shumate	AW6-24AB88	600568831-00/0002101	\$5,000	5/25/2010
15	06 - FINE SCREENING - LIME	Propeller wall exhaust fan	Loren Cook	Shumate	160AW 16A17D	600568831-00/0003801	\$5,000	5/25/2010
16	06 - FINE SCREENING - LIME	Propeller wall exhaust fan	Loren Cook	Shumate	AW6-20A11CA	600568831-00/0004801	\$5,000	5/25/2010
17	06 - FINE SCREENING - LIME	Silo No. 1 Truck Fill Panel	RDP Technologies	TDH Company	08003	UL# 979572	\$10,000	5/25/2010
18	06 - FINE SCREENING - LIME	Silo No. 2 Truck Fill Panel	RDP Technologies	TDH Company	08003	UL# 979572	\$10,000	5/25/2010
19	06 - FINE SCREENING - LIME	Line System No. 2 FGP	RDP Technologies	TDH Company	08003	UL# 979572	\$10,000	5/25/2010
20	06 - FINE SCREENING - LIME	Compressed air FCP	Quincy	Pizzagalli	N/A	III II 879571	\$10,000	5/25/2010
21	06 - FINE SCREENING - LIME	Line Unloading Blower H/J	Benshaw Controls	Aarzen	N/A	5203	\$5,000	5/25/2010
22	06 - FINE SCREENING - LIME	Peckle Line Flow Valve H1	Ray	RDJ	30-119	L-208141 76-3	\$2,000	5/25/2010
23	06 - FINE SCREENING - LIME	Peckle Line Flow Valve H1	Ray	RDJ	30-119	70663469	\$2,000	5/25/2010
24	06 - FINE SCREENING - LIME	Peckle Line Flow Valve H2	Ray	RDJ	30-119	70663469	\$2,000	5/25/2010
25	06 - FINE SCREENING - LIME	Peckle Line Flow Valve H2	Ray	RDJ	30-119	70663469	\$2,000	5/25/2010
26	06 - FINE SCREENING - LIME	Peckle Line Flow Valve H2	Ray	RDJ	30-119	70663469	\$2,000	5/25/2010
27	06 - FINE SCREENING - LIME	Line Screen No. 1 Inlet Gate	Fontaine	Fontaine	2537272K/FF	253610456221-1	\$20,000	5/25/2010
28	06 - FINE SCREENING - LIME	Line Screen No. 2 Inlet Gate	Fontaine	Fontaine	2537272K/FF	253610456221-1	\$20,000	5/25/2010
29	06 - FINE SCREENING - LIME	Line Screen No. 1 Outlet Gate	Fontaine	Fontaine	2537272K/FF	253610456221-1	\$20,000	5/25/2010
30	06 - FINE SCREENING - LIME	Line Screen No. 2 Outlet Gate	Fontaine	Fontaine	2537272K/FF	253610456221-1	\$20,000	5/25/2010
31	06 - FINE SCREENING - LIME	Line Screen Inlet Box Gate	Fontaine	Fontaine	2537272K/FF	253610456221-1	\$20,000	5/25/2010
32	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-022	\$787	5/25/2010
33	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-019	\$578	5/25/2010
34	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
35	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
36	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
37	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
38	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
39	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
40	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
41	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
42	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
43	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
44	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
45	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
46	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
47	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
48	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
49	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
50	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
51	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
52	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010
53	06 - FINE SCREENING - LIME	480V Panelboard	Eaton	Mayer	PRL3A	LAT 04380-020	\$578	5/25/2010

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SECTION 01 62 00

STORAGE AND PROTECTION

PART 1 – GENERAL

1.01 SCOPE

The Work under this Section includes the furnishing of all labor, tools and materials to properly store and protect all materials and products, including spare parts.

1.02 STORAGE AND PROTECTION

- A. Storage: Maintain ample way for foot traffic at all times, except as otherwise approved by the Engineer. Packaged materials shall be delivered in original unopened containers and so stored until ready for use. Store products, including spare parts, in accordance with manufacturer's instructions.
- B. Protection: Use all means to protect the materials and products, including spare parts, of every section before, during and after installation and to protect the installed work and materials of all other trades. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage, vandalism or other causes.
- C. Replacements: In the event of damage, immediately make all repairs and replacements for the approval of the Engineer and at no additional cost to the Owner.
- D. Products 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 to facilitate drainage.
- E. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement and grout shall be stored indoors in a dry location. Building products such as rough lumber and plywood may be stored outdoors. Reinforcing steel, anchor bolts, concrete inserts, wire ties, wall ties, sleeves, and the like, shall be stored off the ground (e.g., on pallets) in a prepared area. The prepared area shall be adequately sized and covered with no less than 6 inches of graded aggregate base (or open graded stone) to ensure that the stored materials are not contaminated with mud, dirt, or other foreign material detrimental to the stored items or the constructed product.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION (Not used)

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SECTION 01 70 00
PROJECT CLOSEOUT

PART 1 – GENERAL

1.01 SCOPE

A. Final Cleaning

1. At the completion of the work, the Contractor shall remove all rubbish from and about the site of the work, and all temporary structures, construction signs, tools, scaffolding, materials, supplies and equipment which he or any of his Subcontractors may have used in the performance of the work. Contractor shall broom-clean paved surfaces and rake-clean other surfaces of grounds.
2. Contractor shall thoroughly clean all materials, equipment and structures; all marred surfaces shall be touched up to match adjacent surfaces; dirty filters and burned out lights replaced as required; all glass surfaces cleaned and floors cleaned and polished so as to leave work in a clean and new appearing condition.
3. Contractor shall maintain cleaning until project, or portion thereof, is occupied by the Owner.

B. Spare Parts and Special Tools

1. As soon as practicable after approval of the list of equipment, the Contractor shall furnish spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies, with current unit prices and source or sources of supply.
2. Contractor shall also furnish a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified to be furnished as part of the Contract and a list of additional items recommended by the manufacturer to assure efficient operation for a period of one-hundred and twenty (120) days for the particular installation.
3. All parts shall be securely boxed and tagged, and clearly marked on the box and individually for identification as to the name of manufacturer or supplier, applicable equipment, part number, description and location in the equipment. All parts shall be protected and packaged for a shelf life of at least ten (10) years.
4. Contractor shall furnish at no additional cost to the Owner with each piece of equipment as a minimum, one (1) complete set, or the number of sets called for in the Technical Specifications, of suitably marked special tools and appliances which may be needed to adjust, operate, maintain, or repair the equipment.
5. Contractor shall submit, for approval by the Engineer, a complete list of the special tools and appliances to be furnished. Such tools and appliances shall be furnished

in approved painted steel cases properly labeled and equipped with good grade cylinder locks and duplicate keys.

6. Prior to Project close-out, Contractor shall submit to the Engineer a complete list of spare parts and special tools required by the Specifications and provided by the manufacturers. This list shall have each item signed by the Contractor certifying that it was delivered and turned over to the Owner.

C. Equipment Start-Up Services

1. Equipment start-up period, for the training of plant personnel, shall begin after satisfactory completion and acceptance of the field tests and coincidentally with the certified date of substantial completion for the part of the work for which the equipment is included. If the equipment is not covered by a certificate of substantial completion for a part of the work, the period shall begin upon substantial completion of the Project.
2. During the equipment start-up period the Contractor shall furnish, at no additional cost to the Owner, the services of factory trained representatives of the equipment manufacturers for the equipment designated in the Specifications to:
 - a. Assist in the start-up and operations of the equipment.
 - b. Assist in the training of plant personnel, designated by the Owner in the proper operation and maintenance of the equipment.
 - c. Record in digital video format the start-up performed and training of Owner's staff.
3. The Owner shall:
 - a. Provide the necessary plant personnel to be instructed in the operation and maintenance of the equipment. The Owner's personnel shall operate all equipment.
 - b. Pay for all fuel, power and chemicals consumed beyond quantities specified in the Contract Documents. The Contractor shall pay for fuel, power, and chemicals consumed up to the date of "certified substantial completion" except as otherwise specified herein.
4. Contractor shall be available to promptly repair all work during the start-up period so as to cause minimum disruption to the total plant operation.

D. Final Cleanup; Site Rehabilitation

1. Before finally leaving the site, the Contractor shall wash and clean all exposed surfaces which have become soiled or marked, and shall remove from the site of work all accumulated debris and surplus materials of any kind which result from his operation, including construction equipment, tools, sheds, sanitary enclosures, etc. The Contractor shall leave all equipment, fixtures, and work, which he has installed,

in a clean condition. The completed project shall be turned over to the Owner in a neat and orderly condition.

2. The site of the work shall be rehabilitated or developed in accordance with other sections of the Specifications and the Drawings. In the absence of any portion of these requirements, the Contractor shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction, except for those items whose permanent removal or relocation was required in the Contract Documents or ordered by the Owner.

E. Final Inspection

1. Final cleaning and repairing shall be so arranged as to be finished upon completion of the construction work. The Contractor will make his final cleaning and repairing, and any portion of the work finally inspected and accepted by the Engineer shall be kept clean by the Contractor, until the final acceptance of the entire work.
2. When the Contractor has finally cleaned and repaired the whole or any portion of the work, he shall notify the Engineer that he is ready for final inspection of the whole or a portion of the work, and the Engineer will thereupon inspect the work. If the work is not found satisfactory, the Engineer will order further cleaning, repairs, or replacement.
3. When such further cleaning or repairing is completed, the Engineer, upon further notice, will again inspect the work. The "Final Payment" will not be processed until the Contractor has complied with the requirements set forth, and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

F. Project Closeout

1. As construction of the project enters the final stages of completion, the Contractor shall, in concert with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items as they apply to his contract:
 - a. Scheduling equipment manufacturers' visits to site.
 - b. Required testing of project components.
 - c. Scheduling start-up and initial operation.
 - d. Scheduling and furnishing skilled personnel during initial operation.
 - e. Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by the Engineer's "Punch" Lists.
 - f. Attend to any other items listed herein or brought to the Contractor's attention by the Engineer.

2. Just before the Engineer's Certificate of Substantial Completion is issued, the Contractor shall accomplish the cleaning and final adjustment of the various building components as specified in the Specifications and as follows:
 - a. Clean all glass and adjust all windows and doors for proper operation.
 - b. Clean all finish hardware after adjustment for proper operation.
 - c. Touch up marks or defects in painted surfaces and touch up any similar defects in factory finished surfaces.
 - d. Wax all resilient flooring materials.
 - e. Remove bitumen from gravel stops, fascias, and other exposed surfaces.
 - f. Remove all stains, marks, fingerprints, soil, spots, and blemishes from all finished surfaces, tile, stone, brick, and similar surfaces.

3. In addition, and before the Certificate of Substantial Completion is issued, the Contractor shall submit to the Engineer (or to the Owner if indicated) certain records, certifications, etc., which are specified elsewhere in the Contract Documents. A partial list of such items appears below, but it shall be the Contractor's responsibility to submit any other items which are required in the Contract Documents:
 - a. Test results of project components.
 - b. Certification of equipment or materials in compliance with Contract Documents.
 - c. Operation and maintenance instructions or manuals for equipment.
 - d. One set of neatly marked-up record drawings showing as-built changes and additions to the work under his Contract.
 - e. One complete hard copy set of all submittals, organized and cataloged in storage boxes suitable for archiving. Additionally, all submittals shall be provided in PDF format on a single external hard drive.
 - f. All documentation required for the Owner's Asset Management Registry, including completed spreadsheet database that include the complete cost of each piece of equipment (cost of materials, not installation).
 - g. Any special guarantees or bonds (Submit to Owner).
 - h. Close-out documentation from the issuing agency for all permits obtained by the Contractor for the Project.

4. The Contractor's attention is directed to the fact that required certifications and information under Item 3 above, must actually be submitted earlier in accordance with other Sections of the Specifications.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

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SECTION 01 71 23.16

CONSTRUCTION SURVEYS AND STAKING

PART 1 – GENERAL

1.01 SCOPE

- A. Construction staking shall include all of the surveying work required for construction of the Work to the lines, grades and elevations shown on the plans. The Contractor shall be responsible for constructing the Project to the horizontal and vertical alignment as shown on the Drawings, as specified, or as ordered by the Engineer. The Contractor shall bear any costs of correcting work constructed in the wrong location.
- B. Contractor shall:
 - 1. Set reference points and/or offsets, 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 the limits of construction to ensure that the Work conforms to same.
 - 4. Be responsible for the re-establishment of reference points, baselines, center lines and temporary bench marks that are damaged during construction.
- C. Record Drawing surveys shall be performed in accordance with Sections 01 70 00.

1.02 CONTROL POINTS

- A. The Drawings show location and/or coordinates of principal components of the Project. Several survey monuments have been established on the project site with x, y and z coordinates; this data will be provided to the Contractor. The firm of TerraMark Land Surveying, Inc. of Marietta, Georgia, performed surveying for design purposes. Contact person is Bill Wohlford, (770) 421-1927.

1.03 QUALITY ASSURANCE

- A. The Contractor may provide either construction staking utilizing his employees provided they are, in the Engineer's opinion, properly equipped and qualified for the work they perform, or he may employ the services of a licensed surveyor who is acceptable to the Engineer. If construction staking by employees is not to the Engineer's satisfaction, then the Contractor will be required to employ the services of a licensed surveyor who is acceptable to the Engineer. The cost of either service shall be provided at no additional cost to the Owner.
- B. At least one week prior to construction of each pipe, structure or component of the Project, Contractor shall furnish the Engineer a copy of documentation confirming that staking has been done to the horizontal and vertical alignment shown in the Contract Documents.

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SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 – GENERAL

1.01 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. Field orders or written instructions, including Requests for Information (RFI) and Clarification Memorandums.
 - 5. Reviewed shop drawings, product data and samples.
 - 6. Test records.
 - 7. Equipment and Material.
 - 8. Electrical, Electronic and Equipment Systems.
 - 9. Operation and Maintenance Manuals.
 - 10. Finishes.
- C. The Contractor shall maintain on the Project site throughout the Contract Time an up to date set of Record Drawings.

1.02 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 Owner.

E. Failure to maintain the Record Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.03 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.

1.04 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.

1.05 RECORD DRAWINGS

A. Record Drawings shall be reproducible, shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared. The Contractor will be provided paper sepias of the Drawings, or it may elect to provide reproducible drawings via another method. Reproducible shall be defined as being translucent so as to allow a blueline print to be produced.

B. Legibly mark 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.

2. Site Improvements, Including Underground Utilities

- a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities construction 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. The Record Drawings shall include the horizontal angle and distance between manhole covers.

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 construction, referenced to visible and accessible features of the structure.

1.06 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.

1.07 PRODUCT INFORMATION BINDER (PIB)

A. The PIB shall contain information related to the equipment and material that is incorporated into the project. The Contractor shall create, update, maintain and submit the PIB with the rest of the Project Documents.

- 1. All equipment incorporated into the project including, but not limited to, valves, gates and operators; pumps and motors; meters and backflow preventers; hoists; HVAC; surge control, air and vacuum relief valves; etc. shall be contained in the PIB.
- 2. All material incorporated into the project including, but not limited to, concrete and grout; concrete masonry units, brick and mortar; ladder and handrail; caulk and sealant; insulation; etc. shall be contained in the PIB.

B. Quantity: Two copies of the PIB shall be submitted with the Record Documents. The PIB shall be a 3-ring binder. One digital PDF of the PIB shall be submitted in a USB flash drive.

C. The size of the pages shall be 8-1/2" by 11". Pages of 11" by 17" in size will be allowed but shall be folded to 8-1/2" by 11" so as to fit the PIB.

- D. The PIB shall be divided into sections and shall contain a Table of Contents (TOC). The sectional breakdown of the PIB shall be similar to the Specifications.
- E. In addition to the information required above, the following information shall be supplied for all mechanical, electrical, electronic, and equipment systems incorporated into the project:
 - 1. Section of the Specifications to which the item relates.
 - 2. The manufacturer.
 - 3. The manufacturers cut sheet and data on the item.
 - 4. Model and serial numbers.
 - 5. Operators manual.
 - 6. Maintenance manual.
 - 7. A list of the spare parts furnished, including part numbers.
 - 8. A list and diagram of spare parts available, including part numbers
- F. The following data shall be supplied for all doors and hardware components incorporated into the project:
 - 1. Manufacturer.
 - 2. Model number.
 - 3. Manufacturers cut sheet.
 - 4. Material, color, finish, grade, etc.
 - 5. Type of door, frame, size, etc.
 - 6. Location used (i.e., door number).
- G. The following data shall be supplied for all finishes incorporated into the project:
 - 1. Paint
 - a. Location used (walls, floors, doors, equipment, etc.).
 - b. Paint manufacturer.
 - c. Manufacturer's color code for primer and finish coats.
 - 2. Water proofing, damp proofing and water repellent
 - a. Location used.
 - b. Manufacturer.
 - c. Manufacturer's model number.

- d. Manufacturer's cut sheets, including the Manufacturer's Safety Data Sheet (MSDS).
- 3. Roof Covering
 - a. Manufacturer.
 - b. Installer.
 - c. Type of roof and material including flashing, sealants, sheet metal, substrate, etc.
 - d. Manufacturers cut sheet.
 - e. Sketch showing all roof penetrations including a short description of the size and type of item penetrating the roof. For example - 24" x 24" exhaust fan.
 - f. The names and dates the manufacturer's authorized representative was present on the site to inspect the roof and its installation for compliance with the manufacturer's installation procedures.
 - g. A copy of the Warranty and/or Bond.

H. Calibration Procedures: All equipment and components of the project that require calibration, or are capable of being calibrated, shall have a calibration procedure included in this section of the PIB. All pertinent information shall be submitted and shall include, but not be limited to the following:

- 1. Description of the Equipment, including the manufacturer, model and serial numbers, supplier, date of installation, etc.
- 2. Range of calibration.
- 3. Detailed step by step calibration procedure, including sketch's and/or details, on how to calibrate the item.

1.08 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.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 78 23

OPERATION AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Detailed information for the preparation, submission, and Engineer's review of Operations and Maintenance (O&M) Data, as required by individual Specification sections.

1.02 DEFINITIONS

- A. Preliminary Data: Initial and subsequent submissions for Engineer's review.
- B. Final Data: Engineer-accepted data, submitted as specified herein.
- C. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.03 SEQUENCING AND SCHEDULING

- A. Equipment and System Data:
 - 1. Preliminary Data:
 - a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by Engineer.
 - b. Submit prior to shipment date.
 - 2. Final Data: Submit Instructional Manual Formatted data and Electronic Media Formatted data not less than 30 days prior to equipment or system field functional testing.

1.04 DATA FORMAT

- A. Prepare preliminary and final data in the form of an instructional manual. Final data shall also be provided on electronic media.
- B. Instructional Manual Format:
 - 1. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
 - 2. Size: 8-1/2 inches by 11 inches, minimum.

3. Cover: Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA" and list:
 - a. Project title.
 - b. Designate applicable system, equipment, material, or finish.
 - c. Identify volume number if more than one volume.
 - d. Identity of equipment number and Specification section.
4. Spine:
 - a. Project title.
 - b. Designate applicable system or equipment.
 - c. Identify volume number if more than one volume.
5. Title Page:
 - a. Contractor name, address, and telephone number.
 - b. Subcontractor, Supplier, installer, or maintenance contractor's name, address, and telephone number, as appropriate.
 - 1) Identify area of responsibility of each.
 - 2) Provide name and telephone number of local source of supply for parts and replacement.
6. Table of Contents:
 - a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
 - b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
7. Paper: 20-pound minimum, white for typed pages.
8. Text: Manufacturer's printed data, or neatly typewritten.
9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

C. Electronic Media Format:

1. Portable Document Format (PDF):

- a. After all preliminary data has been found to be acceptable to Engineer, submit Operation and Maintenance data in PDF format on USB flash drive.
 - b. Files to be exact duplicates of Engineer-accepted preliminary data. Arrange by specification number and name.
 - c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.
 - d. Content to be word searchable with all sections indexed/bookmarked.
2. Wiring diagrams shall be provided as electronic drawings in latest version of AutoCAD.
 3. PDF Files shall be electronically indexed/tabbed.

1.05 SUBMITTALS

A. Informational:

1. Preliminary Data for Major Equipment:
 - a. Major equipment shall include the following:
 - 1) None (there is no major equipment included in this project).
2. Preliminary Data for Non-Major Equipment (all equipment not specifically identified as Major Equipment above):
 - a. Submit three copies for Engineer's review.
 - b. If data meets conditions of the Contract:
 - 1) One copy will be returned to Contractor.
 - 2) One copy will be forwarded to Resident Project Representative.
 - 3) One copy will be forwarded to Owner.
 - c. If data does not meet conditions of the Contract:
 - 1) All copies will be returned to Contractor with Engineer's comments (on separate document) for revision.
 - 2) Engineer's comments will be retained in Engineer's file.
 - 3) Resubmit three copies revised in accordance with Engineer's comments.
3. Final Data: Submit three copies in Instructional Manual format specified herein, plus one copy in Electronic Media format specified herein.
 - a. When changes to wiring and/or programming are made subsequent to submission of Final Data, all affected drawings, diagrams, listings, etc. contained in the Final Data shall be updated. Contractor will be allowed to replace outdated copies of wiring diagrams, program listings, etc. with updated, corrected versions of the

same by removing the outdated items from the Final Data Instructional Manuals and inserting the updated corrected copies. For Final Data in Electronic Media format, Contractor shall provide completely new Electronic Media formatted version of the entire Final Data for the affected piece of equipment.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

A. Content for Each Unit (or Common Units) and System:

1. Product Data:

- a. Include only those sheets that are pertinent to specific product.
 - b. Clearly annotate each sheet to:
 - 1) Identify specific product or part installed.
 - 2) Identify data applicable to installation.
 - 3) Delete references to inapplicable information.
 - c. Function, normal operating characteristics, and limiting conditions.
 - d. Performance curves, engineering data, nameplate data, and tests.
 - e. Complete nomenclature and commercial number of replaceable parts.
 - f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
 - g. Spare parts ordering instructions.
 - h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, and terminals).
2. As-installed, color-coded piping diagrams.
 3. Charts of valve tag numbers, with the location and function of each valve.
 4. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
 - a. Format:
 - 1) Provide reinforced, punched, binder tab; bind in with text.
 - 2) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
 - 3) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
 - 4) Identify Specification section and product on Drawings and envelopes.

- 5) All information required to be submitted in hard copy shall also be provided as digital PDF on USB flash drive.
 - b. Relations of component parts of equipment and systems.
 - c. Control and flow diagrams.
 - d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
5. Instructions and Procedures: Within text, as required to supplement product data.
- a. Format:
 - 1) Organize in consistent format under separate heading for each different procedure.
 - 2) Provide logical sequence of instructions for each procedure.
 - 3) Provide information sheet for Owner's personnel, including:
 - a) Proper procedures in event of failure.
 - b) Instances that might affect validity of guarantee or Bond.
 - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
 - c. Operating Procedures:
 - 1) Startup, break-in, routine, and normal operating instructions.
 - 2) Test procedures and results of factory tests where required.
 - 3) Regulation, control, stopping, and emergency instructions.
 - 4) Description of operation sequence by control manufacturer.
 - 5) Shutdown instructions for both short and extended duration.
 - 6) Summer and winter operating instructions, as applicable.
 - 7) Safety precautions.
 - 8) Special operating instructions.
 - d. Maintenance and Overhaul Procedures:
 - 1) Routine maintenance.

- 2) Guide to troubleshooting.
 - 3) Disassembly, removal, repair, reinstallation, and re-assembly.
6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 70 00, Execution and Closeout Requirements.
- B. Content for Each Electric or Electronic Item or System:
1. Description of Unit and Component Parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, nameplate data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Interconnection wiring diagrams, including control and lighting systems.
 2. Circuit Directories of Panelboards:
 3. Electrical service.
 4. Control requirements and interfaces.
 5. Communication requirements and interfaces.
 6. List of electrical relay settings, and control and alarm contact settings.
 7. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
 8. As-installed control diagrams by control manufacturer.
 9. Listing of PLC program with narrative.
 10. Electronic version of PLC program for re-loading by plant personnel.
 11. Operating Procedures:
 - a. Routine and normal operating instructions.
 - b. Startup and shutdown sequences, normal and emergency.
 - c. Safety precautions.
 - d. Special operating instructions.
 12. Maintenance Procedures:
 - a. Routine maintenance.
 - b. Guide to troubleshooting.

- c. Adjustment and checking.
 - d. List of relay settings, control and alarm contact settings.
13. Manufacturer's printed operating and maintenance instructions.
14. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

C. Maintenance Summary:

- 1. Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
- 2. Format:
 - a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
 - b. Each Maintenance Summary may take as many pages as required.
 - c. Use only 8-1/2-inch by 11-inch size paper.
 - d. Complete using printing.
 - e. All information required to be submitted in hard copy shall also be provided as digital PDF on USB flash drive.
- 3. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
- 4. Recommended Spare Parts:
 - a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
 - b. "Unit" is the unit of measure for ordering the part.
 - c. "Quantity" is the number of units recommended.
 - d. "Unit Cost" is the current purchase price.

1.07 SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this Specification.
 - 1. Forms: Maintenance Summary Form (2 pages).

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.01 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 (or for longer period as may be specified in individual equipment Sections) from the date of Owner's written acceptance of the Work and/or Engineer's written final acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects in workmanship, design and/or materials. The Contractor shall promptly make such corrections as may be necessary by reason of such faulty defects or workmanship. The Equipment Supplier shall repair or replace without charge to the Owner any part of equipment which is defective or showing undue wear within the guarantee period or replace the equipment with new equipment if the mechanical performance is unsatisfactory; furnishing all parts, materials, labor, etc., necessary to return the equipment to its specified performance level. 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 consequences prior to the expiration of the 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 warranty period equal to the original warranty period shall be provided against defective or deficient design, workmanship, and materials and 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 (2) 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 housings, 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 operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over- or under-lubrication and using maintenance procedures not conforming 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 the original full warranty period.

- 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. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one (1) 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.
- G. In the event the Contractor fails to proceed to remedy the defects upon notification within ten (10) 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.
- H. The Equipment Suppliers shall guarantee to the Owner that all equipment offered under these specifications, or that any process resulting from the use of such equipment in the manner stated is not the subject of patent litigation, and that he has not knowingly offered equipment, the installation or use of which is likely to result in a patent controversy, in which the Owner as user is likely to be made the defendant. Where patent infringements are likely to occur, each Equipment Supplier shall submit, as a part of his bid, license arrangements between himself, or the manufacturer of the equipment offered, and the patent owner or the controller of the patent, which will permit the use in the specified manner of such mechanical equipment as he may be bidding. Each Equipment Supplier, by submitting his bid, agrees to hold and save the Owner and Engineer or its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the work under this contract, including the use of the same by the Owner.
- I. 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.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 EQUIPMENT WARRANTY DOCUMENTATION

- A. The Contractor shall provide an equipment warranty log book prepared specifically for this project and submit two (2) copies of the document to the Engineer prior to the beginning of the warranty period and prior to Final Payment. The equipment warranty log book shall include a summary listing of all equipment warranties provided, date received, and start date and end date of warranty period. A copy of each equipment warranty and equipment start-

up certification shall also be provided in the document. The document shall be provided in both hard copy and electronic (.PDF) searchable format.

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SECTION 02 01 00

MAINTENANCE OF EXISTING CONDITIONS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall be responsible for the preservation and protection of property adjacent to the work site against damage or injury as a result of his operations under this Contract. Any damage or injury occurring on account of any act, omission or neglect on the part of the Contractor shall be restored in a proper and satisfactory manner or replaced by and at the expense of the Contractor to an equal or superior condition than previously existed.
- B. Contractor shall comply promptly with such safety regulations as may be prescribed by the Owner or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of, his employees. In the event of the Contractor's failure to comply, the Owner may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the Contractor. Failure of the Engineer to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.
- C. In the event of any claims for damage or alleged damage to property as a result of work under this Contract, the Contractor shall be responsible for all costs in connection with the settlement of or defense against such claims. Prior to commencement of work in the vicinity of property adjacent to the work site, the Contractor, at his own expense, shall take such surveys as may be necessary to establish the existing condition of the property. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled or sufficient funds to cover such claims have been placed in escrow, or that an adequate bond to cover such claims has been obtained.

1.02 PROTECTION OF WORK AND MATERIAL

- A. During the progress of the work and up to the date of final payment, the Contractor shall be solely responsible for the care and protection of all work and materials covered by the Contract.
- B. All work and materials shall be protected against damage, injury or loss from any cause whatsoever, and the Contractor shall make good any such damage or loss at his own expense. Protection measures shall be subject to the approval of the Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 02 32 13

SUBSURFACE CONDITIONS

PART 1 – GENERAL

1.01 GENERAL

The following soils investigation report has been prepared for the site:

Report of Subsurface Exploration and Geotechnical Engineering Evaluation
New 6 Million-Gallon Clearwell, Hugh A. Wyckoff Water Treatment Plant
Acworth, Georgia
Geo-Hydro Project Number 181244.20
Dated: March 8, 2019
By: Geo-Hydro Engineers, Inc.

PART 2 – PRODUCTS

2.01 REPORT

The soils investigation report is available from the Engineer.

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SECTION 02 41 13

DEMOLITION AND REMOVAL OF EXISTING STRUCTURES AND EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the demolition, removal, and disposal of existing structures and equipment as indicated on the Drawings and as specified hereinafter. The Contractor shall furnish all labor, materials and equipment to demolish piping, manholes and other structures, concrete, electrical conduit and cable and to remove fixtures, anchors, and supports and accessories designated to be removed on the Drawings.

1.02 TITLE TO EQUIPMENT AND MATERIALS

- A. Owner shall have first right of refusal for equipment and materials removed by Contractor. Contractor shall have no right or title to any of the equipment, materials or other items to be removed from the existing buildings or structures unless and until said equipment, materials and other items have been removed from the premises. The Contractor shall not sell or assign or attempt to sell or assign any interest in the said equipment, materials or other items until the said equipment, materials or other items have been removed.
- B. Contractor shall have no claim against the Owner because of the absence of such fixtures and materials.

1.03 CONDITION OF STRUCTURES AND EQUIPMENT

- A. The Owner does not assume responsibility for the actual condition of equipment to be demolished and removed.
- B. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner so far as practicable.
- C. The information regarding the existing structures and equipment shown on the Drawings is based on visual inspection and a walk-through survey only. Neither the Engineer nor the Owner will be responsible for interpretations or conclusions drawn therefrom by the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 DEMOLITION AND REMOVALS

- A. The removal of all equipment and piping, and all materials from the demolition of buildings and structures shall, when released by the Owner and Engineer, be performed by the Contractor and shall become the Contractor's property, unless otherwise noted, for

disposition in any manner not contrary to the Contract requirements and shall be removed from the site to the Contractor's own place of disposal.

- B. The Electrical Contractor (Subcontractor) specifically, shall de-energize all panelboards, lighting fixtures, switches, circuit breakers, electrical conduits, motors, limit switches, pressure switches, instrumentation such as flow, level and/or other meters, wiring, and similar power equipments prior to removal. Any electric panels or equipment which are to be retained shall be relocated or isolated by the Electrical Contractor (Subcontractor) specifically, prior to the removal of the equipment specified herein.
- C. The Contractor shall proceed with the removal of the equipment, piping and appurtenances in a sequence designed to maintain the plant in continuous operation and shall proceed only after approval of the Engineer.
- D. Any equipment, piping and appurtenances removed without proper authorization, which are necessary for the operation of the existing facilities shall be replaced to the satisfaction of the Engineer at no cost to the Owner.

3.02 PROTECTION

- A. Demolition and removal work shall be performed by competent experienced workmen for the various types of demolition and removal work and shall be carried out through to completion with due regard to the safety of Owner's employees, workmen on-site and the public. The work shall be performed with as little nuisance as possible.
- B. The work shall comply with the applicable provisions and recommendation of ANSI A10.2, Safety Code for Building Construction, all governing codes, and as hereinafter specified.
- C. The Contractor shall make such investigations, explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. The Contractor shall give particular attention to shoring and bracing requirements so as to prevent any damage to new or existing construction.
- D. The Contractor shall provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, workmen engaged in demolition operations, and adjacent construction.
- E. The Contractor shall provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.
- F. The Contractor shall provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled or equipment moved.
- G. The Contractor shall take necessary precautions to prevent dust from rising by wetting demolished masonry, concrete, plaster and similar debris. Unaltered portions of the existing buildings affected by the operations under this Section shall be protected by dust-proof partitions and other adequate means.
- H. The Contractor shall provide adequate fire protection in accordance with local Fire Department requirements.
- I. The Contractor shall not close or obstruct walkways, passageways, or stairways and shall not store or place materials in passageways, stairs or other means of egress. The Contractor shall conduct operations with minimum traffic interference.

- J. The Contractor shall be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.

3.03 WORKMANSHIP

- A. The demolition and removal work shall be performed as described in the Contract Documents. The work required shall be done with care, and shall include all required shoring, bracing, etc. The Contractor shall be responsible for any damage which may be caused by demolition and removal work to any part or parts of existing structures or items designated for reuse or to remain. The Contractor shall perform patching, restoration and new work in accordance with applicable Technical Sections of the Specifications and in accordance with the details shown on the Drawings. Prior to starting of work, the Contractor shall provide a detailed description of methods and equipment to be used for each operation and the sequence thereof for review by the Engineer.
- B. All supports, pedestals and anchors shall be removed with the equipment and piping unless otherwise specified or required. Concrete bases, anchor bolts and other supports shall be removed to approximately 1-inch below the surrounding finished area and the recesses shall be patched to match the adjacent areas. Superstructure wall and roof openings shall be closed, and damaged surfaces shall be patched to match the adjacent areas, as specified under applicable Sections of these Specifications, as shown on the Drawings, or as directed by the Engineer. Wall sleeves and castings shall be plugged or blanked off, all openings in concrete shall be closed in a manner meeting the requirements of the appropriate Sections of these Specifications, as shown on the Drawings, and as directed and approved by the Engineer.
- C. Materials or items designated to remain the property of the Owner shall be as hereinafter tabulated. Such items shall be removed with care and stored at a location at the site to be designated by the Owner.
- D. Where equipment is shown or specified to be removed and relocated, the Contractor shall not proceed with removal of this equipment without specific prior approval of the Engineer. Upon approval, and prior to commencing removal operations, the equipment shall be operated in the presence of representatives of the Contractor, Owner and Engineer. Such items shall be removed with care, under the supervision of the trade responsible for reinstallation and protected and stored until required. Material or items damaged during removal shall be replaced with similar new material or item. Any equipment that is removed without proper authorization and is required for plant operation shall be replaced at no cost to the Owner.
- E. Wherever piping is to be removed for disposition, the piping shall be drained by the Contractor and adjacent pipe and headers that are to remain in service shall be blanked off or plugged and then anchored in an approved manner.
- F. Materials or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the property and legally disposed of.
- G. The Contractor shall execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building.
- H. Where alterations occur, or new and old work join, the Contractor shall cut, remove, patch, repair or refinish the adjacent surfaces to the extent required by the construction conditions, so as to leave the altered work in as good a condition as existed prior to the start of the work. The materials and workmanship employed in the alterations, unless otherwise shown

on the Drawing or specified, shall comply with that of the various respective trades which normally perform the particular items or work.

- I. The Contractor shall finish adjacent existing surfaces to new work to match the specified finish for new work. The Contractor shall clean existing surfaces of dirt, grease, loose paint, etc., before refinishing.
- J. The Contractor shall cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
- K. The Contractor shall remove temporary work, such as enclosures, signs, guards, and the like when such temporary work is no longer required or when directed at the completion of the work.

3.04 MAINTENANCE

- A. The Contractor shall maintain the buildings, structures and public properties free from accumulations of waste, debris and rubbish, caused by the demolition and removal operations.
- B. The Contractor shall provide on-site dump containers for collection of waste materials, debris and rubbish, and he shall wet down dry materials to lay down and prevent blowing dust.
- C. At reasonable intervals during the progress of the demolition and removal work or as directed by the Engineer, the Contractor shall clean the site and properties, and dispose of waste materials, debris and rubbish.

3.05 EQUIPMENT AND MATERIALS RETAINED BY OWNER

- A. No equipment or materials will be retained by the Owner.

- END OF SECTION -

SECTION 03 01 32
MODIFICATIONS AND REPAIR TO CONCRETE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein. Work under this Section shall also include bonding new concrete to existing concrete.

1.02 RELATED WORK

- A. Concrete Formwork is included in Section 03 11 00.
- B. Concrete Reinforcement is included in Section 03 20 00.
- C. Concrete Accessories are included in Section 03 15 00.
- D. Cast-in-Place Concrete is included in Section 03 30 00.
- E. Concrete Finishes are included in Section 03 35 00.
- F. Grout is included in Section 03 60 00.

1.03 SUBMITTALS

- A. Submit to the Engineer a schedule of Demolition and the detailed methods of demolition to be used at each location.
- B. Submit manufacturer's technical literature on all product brands proposed for use, to the Engineer for review. The submittal shall include the manufacturer's installation and/or application instructions.
- C. When substitutions for acceptable brands of materials specified herein are proposed, submit brochures and technical data of the proposed substitutions to the Engineer for approval before delivery to the project.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - 2. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - 3. ASTM C883 - Standard Test Method for Effective Shrinkage of Epoxy-Resin Systems Used with Concrete.
 - 4. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
 - 5. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
 - 6. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
 - 7. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.
 - 8. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.
- B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, shoring and bracing and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, protect personnel, control dust and to prevent damage to the structures or contents by falling or flying debris. Unless otherwise permitted, shown or specified, line drilling will be required in cutting existing concrete.
- C. Manufacturer Qualifications: The manufacturer of the specified products shall have a minimum of 10 years experience in the manufacture of such products and shall have an ongoing program of training, certifying and technically supporting the Contractor's personnel.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver the specified products in original, unopened containers with the manufacturer's name, labels, product identification and batch numbers.
- B. Store and condition the specified product as recommended by the manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General
 - 1. Materials shall comply with this Section and any state or local regulations.
- B. Epoxy Bonding Agent
 - 1. General
 - a. The epoxy bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete complying with the requirements of ASTM C881, Type II and the additional requirements specified herein.
 - 2. Material
 - a. Properties of the cured material:
 - i. Compressive Strength (ASTM D695): 8500 psi minimum at 28 days.
 - ii. Tensile Strength (ASTM D638): 4000 psi minimum at 14 days.
 - iii. Flexural Strength (ASTM D790 - Modulus of Rupture): 6,300 psi minimum at 14 days.
 - iv. Shear Strength (ASTM D732): 5000 psi minimum at 14 days.

- v. Water Absorption (ASTM D570 – 2-hour boil): One percent maximum at 14 days.
 - vi. Bond Strength (ASTM C882) Hardened to Plastic: 1500 psi minimum at 14 days moist cure.
 - vii. Effective Shrinkage (ASTM C883): Passes Test.
 - viii. Color: Gray.
3. Approved manufacturers include: Sika Corporation, Lyndhurst, NJ - Sikadur 32, Hi-Mod; Master Builder's, Cleveland, OH - Concesive Liquid (LPL) or equal.

C. Epoxy Paste

1. General

- a. Epoxy Paste shall be a two-component, solvent-free, asbestos free, moisture insensitive epoxy resin material used to bond dissimilar materials to concrete and shall comply with the requirements of ASTM C881, Type I, Grade 3 and the additional requirements specified herein. It may also be used to patch existing surfaces where the glue line is 1/8-in or less.

2. Material

- a. Properties of the cured material:
 - i. Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.
 - ii. Tensile Strength (ASTM D638): 3,000 psi minimum at 14 days. Elongation at Break - 0.3 percent minimum.
 - iii. Flexural Strength (ASTM D790 - Modulus of Rupture): 3,700 psi minimum at 14 days.
 - iv. Shear Strength (ASTM D732): 2,800 psi minimum at 14 days.
 - v. Water Absorption (ASTM D570): 1.0 percent maximum at 7 days.
 - vi. Bond Strength (ASTM C882): 2,000 psi at 14 days moist cure.
 - vii. Color: Concrete grey.

3. Approved manufacturers include:

- a. Sika Corporation, Lyndhurst, N.J. - Sikadur Hi-mod LV 32; Master Builders, Inc., Cleveland, OH - Concesive 1438 or equal.
- b. Overhead applications: Sika Corporation, Lyndhurst, NJ - Sikadur Hi-mod LV 31; Master Builders, Inc., Cleveland, OH - Concesive 1438 or equal.

D. Repair Mortar

1. General

- a. Repair mortal shall be a two-component, polymer modified, cement based, fast-setting, trowel grade, structural repair mortar suitable for use on horizontal, vertical and overhead surfaces prepackaged product specifically formulated for the repair of concrete surface defects.

2. Material

a. Properties of the cured material:

- i. Compressive Strength (2 hours 50 percent RH) – 150 psi minimum
- ii. Compressive Strength (28 days 50 percent RH) – 150 psi minimum
- iii. Bond Strength (pull off method) – 100 percent concrete substrate failure
- iv. This system shall conform with ANSI/NSF standards for surface contact with potable water.

3. Approved manufacturers include:

- a. Sika Corporation, Lyndhurst, N.J. – SikaTop 122 PLUS or equal.
- b. Overhead applications: Sika Corporation, Lyndhurst, N.J. – SikaTop 123 PLUS or equal.

E. Non-Shrink Precision Cement Grout, Non-Shrink Cement Grout, Non-Shrink Epoxy Grout and Polymer Modified mortar are included in Section 03 60 00, Grouting.

F. Adhesive anchor system and post-installed reinforcing bar connections in concrete shall be equal to HIY-HY 200 adhesive Anchoring System by Hilti Fastening Systems, Tulsa, OK, unless noted otherwise on the drawings. Installation of adhesive system shall be in accordance to the manufacturer's written instructions.

G. Acrylic Latex Bonding Agents shall not be used for this project.

H. Crack Repair Epoxy Adhesive

1. General

- a. Crack Repair Epoxy Adhesive shall be a two-component, solvent-free, moisture insensitive epoxy resin material suitable for crack grouting by injection or gravity feed. It shall be formulated for the specific size of opening or crack being injected.
- b. All concrete surfaces containing potable water or water to be treated for potable use that are repaired by the epoxy adhesive injection system shall be coated with an acceptable epoxy coating system that conforms with ANSI/NSF standards for surface contact with potable water.

2. Material

a. Properties of the cured material

- i. Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.
- ii. Tensile Strength (ASTM D638): 5,300 psi minimum at 14 days. Elongation at Break - 2 to 5 percent.
- iii. Flexural Strength (ASTM D790 - Modulus of Rupture): 12,000 psi minimum at 14 days (gravity); 4,600 psi minimum at 14 days (injection)
- iv. Shear Strength (ASTM D732): 3,700 psi minimum at 14 days.

- v. Water Absorption (ASTM D570 – 2-hour boil): 1.5 percent maximum at 7 days.
- vi. Bond Strength (ASTM C882): 2,400 psi at 2 days dry; 2,000 psi at 14 days dry plus 12 days moist.
- vii. Effective Shrinkage (ASTM 883): Passes Test.

3. Approved manufacturers include:

- a. For standard applications: Sika Corporation, Lyndhurst, NJ - Sikadur Hi-Mod; Master Builders Inc., Cleveland, OH - Concessive 1380 or equal.
- b. For very thin applications; Sika Corporation, Lyndhurst, NJ - Sikadur Hi-Mod LV; Master Builders Inc., Cleveland, OH - Concessive 1468 or equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. Cut, repair, reuse, demolish, excavate or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified herein, or necessary to permit completion of the Work. Finishes, joints, reinforcements, sealants, etc, are specified in respective Sections. All work shall comply with other requirements of this of Section and as shown on the Drawings.
- B. All commercial products specified in this Section shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations.
- C. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint the repairs shall be made to preserve the isolation between components on either side of the joint.
- D. When drilling holes for dowels/bolts at new or existing concrete, drilling shall stop if rebar is encountered. As approved by the Engineer, the hole location shall be relocated to avoid rebar. Rebar shall not be cut without prior approval by the Engineer. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" or ground penetrating radar so that drilled hole locations may be adjusted to avoid rebar interference.

3.02 CONCRETE REMOVAL

- A. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by line drilling at limits followed by chipping or jack-hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete or existing reinforcing to be left in place and existing in place equipment is not damaged. Sawcutting at limits of concrete to be removed shall only be done if indicated on the Drawings, or after obtaining written approval from the Engineer.
- B. Where existing reinforcing is exposed due to saw cutting/core drilling and no new material is to be placed on the sawcut surface, a coating or surface treatment of epoxy paste shall be applied to the entire cut surface to a thickness of 1/4-in.

- C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-in deep saw cut on each exposed surface of the existing concrete.
- D. Concrete specified to be left in place which is damaged shall be repaired by approved means to the satisfaction of the Engineer.
- E. The Engineer may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate.

3.03 SURFACE PREPARATION

- A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified herein, or as directed by the Engineer.
- B. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means, i.e. - sandblasting, grinding, etc, as approved by the Engineer. Be sure the areas are not less than 1/2-in in depth. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete, subject to the Engineer's final inspection.
- C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all contaminants, rust, etc, as approved by the Engineer. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1/2-in. Reinforcing to be saved shall not be damaged during the demolition operation.
- D. Reinforcing from existing demolished concrete which is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding with the repair. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with a minimum cover all around as specified on the contract drawings or 2-in.
- E. The following are specific concrete surface preparation "methods" are to be used where called for on the Drawings, specified herein or as directed by the Engineer. All installation of anchors shall be according to the manufacturer's recommendations.
 - 1. Method A: After the existing concrete surface at connection has been roughened and cleaned, thoroughly moisten the existing surface with water. Brush on a 1/16-in layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as detailed on the Drawings.
 - 2. Method B: After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. Method C: Drill a hole 1/4-in larger than the diameter of the dowel. The hole shall be blown clear of loose particles and dust just prior to installing epoxy. The drilled hole shall first be filled with epoxy paste, and then dowels/bolts shall be buttered with paste then inserted by tapping. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of ten bar diameters and smooth bars shall be drilled and set to a depth of fifteen bar diameters. If not noted on the Drawings, the Engineer will provide details regarding the size and spacing of dowels.
4. Method D: Combination of Method B and C.
5. Method E: Capsule anchor system shall be set in existing concrete by drilling holes to the required depth to develop the full tensile and shear strengths of the anchor material being used. The anchor bolts system shall be installed per the manufacturer's recommendation in holes sized as required. The anchor stud bolt, rebar or other embedment item shall be tipped with a double 45-degree chamfered point, securely fastened into the chuck of all rotary percussion hammer drill and drilled into the capsule filled hole.

3.04 GROUTING

- A. Grouting shall be as specified in Section 03 60 00.

3.05 CRACK REPAIR

- A. Cracks on horizontal surfaces shall be repaired by gravity feeding crack sealant into cracks per manufacturer's recommendations. If cracks are less than 1/16-in in thickness they shall be pressure injected.
- B. Cracks on vertical surfaces shall be repaired by pressure injecting crack sealant through valves sealed to surface with crack repair epoxy adhesive per manufacturer's recommendations.

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SECTION 03 11 00

CONCRETE FORMING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to design, install and remove formwork for cast-in-place concrete complete as shown on the Drawings and specified herein.
- B. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, inserts and other items furnished under other Sections and required to be cast into concrete or approved in advance by the Engineer.

1.02 RELATED WORK

- A. Concrete Reinforcement is included in Section 03 20 00.
- B. Concrete Accessories are included in Section 03 15 00.
- C. Cast-in-Place Concrete is included in Section 03 30 00.
- D. Grout is included in Section 03 60 00.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01 33 00, shop drawings, and product data showing materials of construction and details of installation for:
 - 1. Form release agent
 - 2. Form ties
 - 3. Tapered Ties: Proposed method and products for sealing form tie hole.
- B. Samples
 - 1. Demonstrate to the Engineer on a designated area of the concrete substructure exterior surface that the form release agent will not adversely affect concrete surfaces to be painted, coated or otherwise finished and will not affect the forming materials.
- C. Certificates
 - 1. Statement of qualification for the formwork designer retained by Contractor. Formwork designer shall be a professional engineer registered in the same

state as the project site. Designer shall have at a minimum five years of experience designing the required formwork and falsework systems.

2. Certify that form release agent is suitable for use in contact with potable water after 30 days (non-toxic and free of taste and odor).

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1. ACI 301 – Standard Specification for Structural Concrete
2. ACI 318 – Building Code Requirements for Reinforced Concrete
3. ACI 347 – Formwork for Concrete

B. American Plywood Association (APA)

1. Material grades and designations as specified

- ##### C.
- Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 SYSTEM DESCRIPTION

- ##### A.
- Formwork shall be designed and erected in accordance with the requirements of ACI 301 and ACI 318 and as recommended in ACI 347 and shall comply with all applicable regulations and codes. The design shall consider any special requirements due to the use of plasticized and/or retarded set concrete. Design forms and ties to withstand concrete pressures without budging, spreading, or lifting forms.

- ##### B.
- Architectural Concrete is wall, slab, beam or column concrete which will have surfaces exposed to view in the finished work. It includes similar exposed surfaces in water containment structures from the top of walls to 2-ft below the normal water surface in open tanks and basins.

PART 2 - PRODUCTS

2.01 GENERAL

- ##### A.
- The usage of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configurations desired.

2.02 MATERIALS

- ##### A.
- General: Forms for cast in place concrete shall be made of wood, metal, or other approved material. Construct wood forms of sound lumber or plywood of suitable dimensions and free from knotholes and loose knots. Where used for exposed surfaces, dress and match boards. Sand plywood smooth and fit adjacent panels with tight joints. Metal forms may be used when approved by the Engineer and shall

be of an appropriate type for the class of work involved. All forms shall be designed and constructed to provide a flat, uniform concrete surface requiring minimal finishing or repairs.

B. Wall Forms

1. Forms for all exposed exterior and interior concrete walls shall be all-steel forms producing finish equivalent to that produced by EFCO form systems. Where required due to geometry or conflict with the primary forming system, secondary formwork shall be exterior grade plywood panels manufactured in compliance with the APA and bearing the trademark of that group, or equal acceptable to the Engineer. Provide B grade or better veneer on all faces to be placed against concrete during forming. The class of material and grades of interior plies shall be of sufficient strength and stiffness to provide a flat, uniform concrete surface requiring minimal finishing and grinding.
2. All joints or gaps in forms shall be taped, gasketed, plugged, and/or caulked with an approved material so that the joint will remain watertight and will withstand placing pressures without bulging.
3. Circular Structures: Use forms conforming to the circular shape of the structure. Straight panels may be substituted for circular form. Provided panels to not exceed two (2) feet in horizontal width and angular deflection is no greater than 3 ½ degrees per joint.

C. Column Forms

1. Rectangular Columns: as specified for walls
2. Circular Columns: Fabricated steel or fiber reinforced plastic with bolted together sections or spirally wound laminated fiber form internally treated with form release agent for height of columns.

D. Rustication strips shall be at the location and shall conform to the details shown on the Drawings. Moldings for chamfers and rustications shall be milled and planed smooth. Rustications and corner strips shall be of a nonabsorbent material, compatible with the form surface and fully sealed on all sides to prohibit the loss of paste or water between the two surfaces.

E. Form Release Agent

1. Coat all forming surfaces in contact with concrete using an effective, non-staining, non-residual, water based, bond-breaking form coating unless otherwise noted. Form release agents used in potable water containment structures shall be suitable for use in contact with potable water and shall be non-toxic and free of taste or odor and meet the requirements of NSF/ANSI Standard 61. Form release agent shall be Farm Fresh by Unitex or Engineer approved equal.

F. Form Ties

1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 1 1/2 in off the face of the concrete. The part of the tie to be removed shall be at least 1/2 in diameter or be provided with a wood or metal cone at least 1/2 in diameter and 1 1/2 in long. Form ties in concrete exposed to view shall be the cone washer type.
2. Form ties for exposed exterior and interior walls shall be as specified in the preceding paragraph except that the cones shall be of approved wood or plastic.
3. Flat bar ties for panel forms, if used, shall have plastic or rubber inserts having a minimum depth of 1-1/2-in and sufficient dimensions to permit proper patching of the tie hole.
4. Ties for liquid containment structures shall have an integral waterstop that is tightly welded to the tie.
5. Common wire shall not be used for form ties.
6. Alternate form ties consisting of tapered through-bolts at least 1-in in diameter at smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size may be used at the Contractor's option. Obtain Engineer's acceptance of system and spacing of ties prior to ordering or purchase of forming. Clean, fill and seal form tie hole with non-shrink cement grout. A vinyl plug shall be inserted into the hole to serve as a waterstop. The Contractor shall be responsible for water-tightness of the form ties and any repairs needed.

PART 3 - EXECUTION

3.01 GENERAL

- A. Forms shall be used for all cast-in-place concrete including sides of footings. Forms shall be constructed and placed so that the resulting concrete will be of the shape, lines, dimensions and appearance indicated on the drawings.
- B. Forms for walls shall have removable panels at the bottom for cleaning, inspection and joint surface preparation. Forms for walls of considerable height (15 feet or greater) shall have closable intermediate inspection ports. Tremies and hoppers for placing concrete shall be used to allow concrete inspection, to prevent segregation and to prevent the accumulation of hardened concrete on the forms above the fresh concrete.
- C. Molding, bevels, or other types of chamfer strips shall be placed to produce block outs, rustications, or chamfers as shown on the Drawings or as specified herein. Chamfer strips shall be provided at horizontal and vertical projecting corners to produce a 3/4-in chamfer. Rectangular or trapezoidal moldings shall be placed in

locations requiring sealants where specified or shown on the Drawings. Sizes of moldings shall conform to the sealants manufacturer's recommendations.

- D. Forms shall be sufficiently rigid to withstand construction loads and vibration and to prevent displacement or sagging between supports. Construct forms so that the concrete will not be damaged by their removal. The contractor shall be entirely responsible for the adequacy of the forming system.
- E. Before form material is re-used, all surfaces to be in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn and all protrusions smoothed. Reuse of wooden forms for other than rough finish will be permitted only if a "like new" condition of the form is maintained.

3.02 FORM TOLERANCES

- A. Forms shall be surfaced, designed and constructed in accordance with the recommendations of ACI 301 and shall meet the following additional requirements for the specified finishes.
 - 1. Formed Surface Exposed to View: Edges of all form panels in contact with concrete shall be flush within 1/16-in and forms for plane surfaces shall be such that the concrete will be plane within 3/16-in in 4-ft. Forms shall be tight to prevent the passage of mortar, water and grout. The maximum deviation of the finish wall surface at any point shall not exceed 1/4-in from the intended surface as shown on the Drawings. Form panels shall be arranged symmetrically and in an orderly manner to minimize the number of seams.
 - 2. Formed surfaces not exposed to view or buried shall meet requirements of Class "C" Surface in ACI 301.
 - 3. Formed rough surfaces including mass concrete, pipe encasement, electrical duct encasement and other similar installations shall have no minimum requirements for surface smoothness and surface deflections. The overall dimensions of the concrete shall be plus or minus 1-in.

3.03 FORM PREPARATION

- A. Wood forms in contact with the concrete shall be coated with an effective release agent prior to form installation.
- B. Steel forms shall be thoroughly cleaned, and mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface for all forms, except those utilized for surfaces receiving a rough finish. All forms shall have the contact surfaces coated with a release agent.

3.04 REMOVAL OF FORMS

- A. The Contractor shall be responsible for all damage resulting from removal of forms. Forms and shoring for structural slabs or beams shall remain in place in accordance with ACI 301. Form removal shall conform to the requirements specified in Section 03 30 00 including curing requirements.

- B. Repair all damages resulting from removal of forms.
- C. Clean, fill and seal form tie hole with non-shrink cement grout extending to within 1" of face of wall. Provide cement/sand mix fill with bonding agent in the final 1" of form tie hole. It is the intent of the final patch to match the color of the surrounding concrete. The Contractor shall be responsible for the watertightness of the form ties holes and any repair necessary to maintain watertightness of tie holes.

3.05 INSPECTION

- A. The Engineer on site shall be notified when the forms are complete and ready for inspection at least 6 hours prior to the proposed concrete placement.
- B. Failure of the forms to comply with the requirements specified herein or to produce concrete complying with the requirements of Section 03 30 00 shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced as directed by the Engineer at no additional cost to the Owner. Such repair or replacement shall be subject to the requirements to this Section and approval of the Engineer.

- END OF SECTION -

SECTION 03 15 00

CONCRETE ACCESSORIES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install accessories for concrete joints as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Concrete Formwork is included in Section 03 11 00.
- B. Concrete Reinforcement is included in Section 03 20 00.
- C. Cast-In-Place Concrete is included in Section 03 30 00.
- D. Concrete Finishes are included in Section 03 35 00.
- E. Grout is included in Section 03 60 00.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01 33 00, shop drawings and product data. Submittals shall include at least the following:
 - 1. Standard Waterstops: Product data including catalogue cut, technical data, storage requirements, splicing methods and conformity to ASTM standards.
 - 2. Special Waterstops: Product data including catalogue cut, technical data, location of use, storage requirements, splicing methods, installation instructions and conformity to ASTM standards.
 - 3. Premolded joint fillers: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.
 - 4. Bond breaker: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.
 - 5. Expansion joint dowels: Product data on the complete assembly including dowels, coatings, lubricants, spacers, sleeves, expansion caps, installation requirements and conformity to ASTM standards.
 - 6. Compressible joint filler: Product data including catalogue cut, technical data, storage requirements, installation requirements, location of use and conformity to ASTM standards.

7. Bonding agents: Product data including catalogue cut, technical data, storage requirements, product life, application requirements and conformity to ASTM standards.

B. Certifications

1. Certification that all materials used within the joint system is compatible with each other.
2. Certifications that materials used in the construction of joints are suitable for use in contact with potable water 30 days after installation.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A675 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties.
2. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
3. ASTM C1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
4. ASTM D1751 - Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction. (Nonextruding and Resilient Bituminous Types).
5. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

B. U.S. Army Corps of Engineers (CRD).

1. CRD C572 - Specification for Polyvinylchloride Waterstops.

C. Federal Specifications

1. FS SS-S-210A - Sealing Compound for Expansion Joints.

D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. All materials used together in a given joint (bond breakers, backer rods, joint fillers, sealants, etc.) shall be compatible with one another. Coordinate selection of suppliers and products to ensure compatibility. Under no circumstances shall asphaltic bond breakers or joint fillers be used in joints receiving sealant.
- C. All chemical sealant type waterstops shall be products specifically manufactured for the purpose for which they will be used and the products shall have been successfully used on similar structures for more than five years.

2.02 MATERIALS

A. Standard Waterstops

- 1. PVC Waterstops - The waterstop shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD-C572. The waterstop shall be Greenstreak Group, Inc. model No. 679 or approved equal for construction joints. The waterstop shall be Greenstreak Group Inc. model No.732 or approved equal for control joints and Greenstreak Group Inc. Model No. 738 for expansion joints. Provide grommets or pre-punched holes spaced at 12 inches on center along length of waterstop.
- 2. Factory Fabrications: Provide factory made waterstop fabrications for all changes of direction, transitions, and intersections, leaving only straight butt joints of sufficient length for splicing in the field.

B. Special Waterstops

- 1. Base Seal PVC Waterstop - The waterstop shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD-C572. Waterstops shall be style 925 for expansion joints, style 928 for control joints, and style 927 for construction joints by Greenstreak Plastic Products, St. Louis, MO or equal.
- 2. Preformed adhesive waterstops - The waterstop shall be a rope type preformed plastic waterstop meeting the requirements of Federal Specification SS-S-210A. The rope shall have a cross-section of approximately one square inch unless otherwise specified or shown on the Drawings. The waterstop shall be Synko-Flex waterstop as manufactured by Synko-Flex Products of Houston,

TX, Lockstop by Greenstreak Group Inc., or equal. Primer for the material shall be as recommended by the waterstop manufacturer.

C. Premolded Joint Filler

1. Premolded joint filler - Structures. Self-expanding cork, premolded joint filler shall conform to ASTM D1752, Type III. The thickness shall be 3/4-in unless shown otherwise on the Drawings.
2. Premolded joint filler - sidewalk and roadway concrete pavements or where fiber joint filler is specifically noted on the Drawings. The joint filler shall be asphalt-impregnated fiber board conforming to ASTM D1751. Thickness shall be 3/4-in unless otherwise shown on the Drawings.

D. Bond Breaker

1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint.
2. Except where tape is specifically called for on the drawings, bond breaker for concrete shall be either bond breaker tape or a nonstaining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors Inc.; Silcoseal 77, by SCA Construction Supply Division, Superior Concrete Accessories or equal.

E. Expansion Joint Dowels

1. Dowels shall be smooth steel conforming to ASTM A675, Grade 70. Dowels must be straight and clean, free of loose flaky rust and loose scale. Dowels may be sheared to length provided deformation from true shape caused by shearing does not exceed 0.04-in on the diameter of the dowel and extends no more than 0.04-in from the end. Bars shall be coated with a bond breaker on the expansion end of the dowel. Expansion caps shall be provided on the expansion end. Caps shall allow for at least 1-1/2-in of expansion.
2. Dowel Bar Sleeves: Provide Greenstreak two component Speed Dowel System, to accept 1" diameter x 12" long slip dowels. The Greenstreak Group, Inc. Speed Dowel System is comprised of a reusable base and a plastic sleeve. Both pieces shall be manufactured from polypropylene plastic.

F. Bonding Agent

1. Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881, Type II. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst,

N.J.; Concrete Liquid (LPL) by Master Builders of Cleveland, OH or equal. Acrylic may be used if approved by the Engineer.

G. Compressible Joint Filler

1. The joint filler shall be a non-extruded watertight strip material use to fill expansion joints between structures. The material shall be capable of being compressed at least 40 percent for 70 hours at 68 degrees F and subsequently recovering at least 20 percent of its original thickness in the first 1/2 hour after unloading. Compressible Joint filler shall be Evasote 380 E.S.P., by E-Poxy Industries, Inc., Ravena, NY, Sikaflex 1a by Sika or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Standard Waterstops

1. Install waterstops for all joints where indicated on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Provide factory made waterstop fabrications for all changes in direction, intersections and transitions leaving only straight butt joints splices for the field.
2. Horizontal waterstops in slabs shall be clamped in position by the bulkhead (unless previously set in concrete).
3. Waterstops shall be installed so that half of the width will be embedded on each side of the joint. Care shall be exercised to ensure that the waterstop is completely embedded in void-free concrete.
4. Waterstops shall be terminated 3-in below the exposed top of walls. Expansion joint waterstop center bulbs shall be plugged with foam rubber, 1-in deep, at point of termination.

B. Special Waterstops

1. Install special waterstops at joints where specifically noted on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Provide factory made waterstop fabrications for

all changes in direction, intersections and transitions leaving only straight butt joints splices for the field.

2. Each piece of the waterstop shall be of maximum practicable length to provide a minimum number of connections or splices. Connections and splices shall conform to the manufacturer's recommendations and as specified herein.
3. Waterstops shall be terminated 3-in below the exposed top of walls.

C. Construction Joints

1. Make construction joints only at locations shown on the Drawings or as approved by the Engineer. Any additional or relocation of construction joints proposed by the Contractor, must be submitted to the Engineer for written approval.
2. Additional or relocated joints should be located where they least impair strength of the member. In general, locate joints within the middle third of spans of slabs, beams and girders. However, if a beam intersects a girder at the joint, offset the joint a distance equal to twice the width of the member being connected. Locate joints in walls and columns at the underside of floors, slabs, beams or girders and at tops of footings or floor slabs. Do not locate joints between beams, girders, column capitals, or drop panels and the slabs above them. Do not locate joints between brackets or haunches and walls or columns supporting them.
3. All joints shall be perpendicular to main reinforcement. Continue reinforcing steel through the joint as indicated on the Drawings. When joints in beams are allowed, provide a shear key and inclined dowels as approved by the Engineer.
4. Provide sealant grooves for joint sealant where indicated on the Drawings.
5. At all construction joints and at concrete joints designated on the Drawings to be "roughened", uniformly roughen the surface of the concrete to a full amplitude (distance between high and low points or side to side) of approximately 1/4-in to expose a fresh face. Thoroughly clean joint surfaces

of loose or weakened materials by water-blasting or sandblasting and prepare for bonding.

6. Provide waterstops in all wall and slab construction joints in liquid containment structures and at other locations shown on the Drawings.
7. Keyways shall not be used in construction joints unless specifically shown on the Drawings or approved by the Engineer.

D. Expansion Joints

1. Do not extend through expansion joints, reinforcement or other embedded metal items that are continuously bonded to concrete on each side of joint.
2. Position premolded joint filler material accurately. Secure the joint filler against displacement during concrete placement and compaction. Place joint filler over the face of the joint, allowing for sealant grooves as detailed on the Drawings. Tape all joint filler splices to prevent intrusion of mortar. Seal expansion joints as shown on the Drawings.
3. Expansion joints shall be 3/4-in in width unless otherwise noted on the Drawings.
4. Where indicated on Drawings, install smooth dowels at right angles to expansion joints. Align dowels accurately with finished surface. Rigidly hold in place and support during concrete placement. Unless otherwise shown on the Drawings, apply oil or grease to one end of all dowels through expansion joints. Provide plastic expansion caps on the lubricated ends of expansion dowels.
5. Provide center bulb type waterstops in all wall and slab expansion joints in liquid containment structures and at other locations shown on the Drawings.

E. Control Joints

1. Provide sealant grooves, sealants and waterstops at control joints in slabs on grade or walls as detailed. Provide waterstops at all wall and slab control joints in water containment structures and at other locations shown on the Drawings.
2. Control joints may be sawed if specifically approved by the Engineer. If control joint grooves are sawed, properly time the saw cutting with the time of the concrete set. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Complete cutting before shrinkage stresses have developed sufficiently to induce cracking. No reinforcing shall be cut during saw cutting.
3. Extend every other bar of reinforcing steel through control joints or as indicated on the Drawings. Where specifically noted on the Drawings, coat the concrete

surface with a bond breaker prior to placing new concrete against it. Avoid coating reinforcement or waterstops with bond breaker at these locations.

- END OF SECTION -

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install all concrete reinforcement complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Concrete Formwork is included in Section 03 11 00.
- B. Cast-in-place Concrete is included in Section 03 30 00.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01 33 00, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Reinforcement steel. Placement drawings shall conform to the recommendations of ACI 315. All reinforcement in a concrete placement shall be included on a single placement drawing or cross referenced to the pertinent main placement drawing. The main drawing shall include the additional reinforcement (around openings, at corners, etc.) shown on the standard detail sheets. Bars to have special coatings and/or to be of special steel or special yield strength are to be clearly identified. For all cast-in-place concrete tanks, retaining walls, building stem walls, wall sections shall be included in the drawings.
 - 2. Bar bending details. The bars shall be referenced to the same identification marks shown on the placement drawings.
 - 3. Schedule of all placements to contain synthetic reinforcing fibers. The amount of fibers per cubic yard to be used for each of the placements shall be noted on the schedule. The name of the manufacturer of the fibers and the product data shall be included with the submittal.
- B. Submit Test Reports, in accordance with Section 01 33 00, of each of the following items.
 - 1. Certified copy of mill test on each steel proposed for use showing the physical properties of the steel and the chemical analysis.
 - 2. Welder's certification. The certification shall be in accordance with AWS D1.4 when welding of reinforcement required.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
5. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
6. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
7. ASTM A616 - Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
8. ASTM A617 - Standard Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
9. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
10. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
11. ASTM A775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
12. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
13. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.

B. American Concrete Institute (ACI)

1. ACI 301 - Standard Specification for Structural Concrete
2. ACI 315 - Details and Detailing of Concrete Reinforcement.
3. ACI 318 - Building Code Requirements for Structural Concrete
4. ACI SP-66 - ACI Detailing Manual

C. Concrete Reinforcing Steel Institute (CRSI)

- 1. Manual of Standard Practice
 - D. American Welding Society (AWS)
 - 1. AWS D1.4 - Structural Welding Code Reinforcing Steel
 - E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.
- 1.05 QUALITY ASSURANCE
- A. Provide services of a manufacturer's representative, with at least 2 years' experience in the use of the reinforcing fibers for a preconstruction meeting and assistance during the first placement of the material.
- 1.06 DELIVERY, HANDLING AND STORAGE
- A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.
 - B. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings.
 - C. Reinforcing steel shall be stored off the ground and kept free from dirt, oil, or other injurious contaminants.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials shall be new, of domestic manufacture and shall comply with the following material specifications.
- B. Deformed Concrete Reinforcing Bars: ASTM A615, Grade 60 deformed bars.
- C. Concrete Reinforcing Bars required on the Drawings to be Welded: ASTM A706.
- D. Welded Steel Wire Fabric: ASTM A185. Provide in flat sheets.
- E. Welded Deformed Steel Wire Fabric: ASTM A497.
- F. Welded Plain Bar Mats: ASTM A704 and ASTM A615 Grade 60 plain bars.
- G. Fabricated Deformed Steel Bar Mats: ASTM A184 and ASTM A615 Grade 60 deformed bars.
- H. The following alternate materials are allowed:
 - 1. ASTM A615 Grade 60 may be used for ASTM A706 provided the following requirements are satisfied:

- a. The actual yield strength of the reinforcing steel based on mill tests shall not exceed the specified yield strength by more than 18,000 psi. Retests shall not exceed this value by more than an additional 3000 psi.
 - b. The ratio of the actual ultimate tensile strength to the actual tensile yield strength of the reinforcement shall not be less than 1.25.
 - c. The carbon equivalency (CE) of bars shall be 0.55 or less.
- I. Reinforcing Steel Accessories
1. Plastic Protected Bar Supports: CRSI Bar Support Specifications, Class 1 - Maximum Protection.
 2. Stainless Steel Protected Bar Supports: CRSI Bar Support Specifications, Class 2 - Moderate Protection.
 3. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications, Precast Blocks. Blocks shall have equal or greater strength than the surrounding concrete.
 4. Steel Protected Bar Supports: #4 Steel Chairs with plastic or rubber tips.
- J. Tie Wire
1. Tie Wires for Reinforcement shall be 16-gauge or heavier, black annealed wire or stranded wire.
- K. Mechanical reinforcing steel butt splices shall be positive connecting taper threaded type employing a hexagonal coupler such as Lenton rebar splices as manufactured by Erico Products Inc., Solon, OH or equal. They shall meet all ACI 318 Building Code requirements. Bar ends must be taper threaded with coupler manufacturer's bar threader to ensure proper taper and thread engagement. Bar couplers shall be torqued to manufacturer's recommended value.
1. Unless otherwise noted on the Drawings, mechanical tension splices shall be designed to produce a splice strength in tension or compression of not less than 125 percent of the ASTM specified minimum yield strength of the rebar.
 2. Compression type mechanical splices shall provide concentric bearing from one bar to the other bar and shall be capable of developing the ultimate strength of the rebar in compression.
- L. Fiber Reinforcement
1. Synthetic reinforcing fiber for concrete shall be 100 percent polypropylene collated, fibrillated fibers as manufactured by Propex Concrete Systems Chattanooga, TN - Propex or equal. Fiber length and quantity for the concrete mix shall be in strict compliance with the manufacturer's recommendations as approved by the Engineer.

2.02 FABRICATION

- A. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice.
- B. Bars shall be cold bent. Bars shall not be straightened or rebent.
- C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the ACI 318.
- D. Bar ends that are to be butt spliced, placed through limited diameter holes in metal, or threaded, shall have the applicable end(s) saw-cut. Such ends shall terminate in flat surfaces within 1-1/2 degrees of a right angle to the axis of the bar.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.
- B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:
 - 1. Concrete cast against and permanently exposed to earth: 3-in
 - 2. Concrete exposed to soil, water, sewage, sludge and/or weather: 2-in (Including bottom cover of slabs over water or sewage)
 - 3. Concrete not exposed to soil, water, sewage, sludge and/or weather:
 - a. Slabs (top and bottom cover), walls, joists, shells and folded plate members – 3/4-in
 - b. Beams and columns (principal reinforcement, ties, spirals and stirrups) - 1-1/2-in
- C. Reinforcement which will be exposed for a considerable length of time after being placed shall be coated with a heavy coat of neat cement slurry.
- D. No reinforcing steel bars shall be welded either during fabrication or erection unless specifically shown on the Drawings or specified herein, or unless prior written approval has been obtained from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved or called for, it shall comply with AWS D1.4.
- E. Reinforcing steel interfering with the location of other reinforcing steel, conduits or embedded items, may be moved within the specified tolerances or one bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Engineer. Do not cut reinforcement to install inserts, conduits, mechanical openings or other items without the prior approval of the Engineer.

- F. Securely support and tie reinforcing steel to prevent movement during concrete placement. Secure dowels in place before placing concrete.
- G. Reinforcing steel bars shall not be field bent except where shown on the Drawings or specifically authorized in writing by the Engineer. If authorized, bars shall be cold-bent around the standard diameter spool specified in the CRSI. Do not heat bars. Closely inspect the reinforcing steel for breaks. If the reinforcing steel is damaged, replace, Cadweld or otherwise repair as directed by the Engineer. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the Drawings.

3.02 REINFORCEMENT AROUND OPENINGS

- A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING OF REINFORCEMENT

- A. Splices designated as compression splices on the Drawings, unless otherwise noted, shall be 30 bar diameters, but not less than 12-in. The lap splice length for column vertical bars shall be based on the bar size in the column above.
- B. Tension lap splices shall be provided at all laps in compliance with ACI 318. Splices in adjacent bars shall be staggered. Class A splices may be used when 50 percent or less of the bars are spliced within the required lap length. Class B splices shall be used at all other locations.
- C. Splicing of reinforcing steel in concrete elements noted to be "tension members" on the Drawings shall be avoided whenever possible. However, if required for constructability, splices in the reinforcement subject to direct tension shall be welded to develop, in tension, at least 125 percent of the specified yield strength of the bar. Splices in adjacent bars shall be offset the distance of a Class B splice.
- D. Install wire fabric in as long lengths as practicable. Wire fabric from rolls shall be rolled flat and firmly held in place. Splices in welded wire fabric shall be lapped in accordance with the requirements of ACI-318 but not less than 12-in. The spliced fabrics shall be tied together with wire ties spaced not more than 24-in on center and laced with wire of the same diameter as the welded wire fabric. Do not position laps midway between supporting beams, or directly over beams of continuous structures. Offset splices in adjacent widths to prevent continuous splices.
- E. Mechanical reinforcing steel splicers shall be used only where shown on the Drawings. Splices in adjacent bars shall be offset by at least 30 bar diameters. Mechanical reinforcing splices are only to be used for special splice and dowel conditions approved by the Engineer.

3.04 ACCESSORIES

- A. Determine, provide and install accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

- B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.
- C. Stainless steel bar supports or steel chairs with stainless steel tips shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity, or liquid (including bottom of slabs over liquid containing areas). Use of galvanized or plastic tipped metal chairs along with all plastic chairs is permissible in all other locations unless otherwise noted on the Drawings or specified herein.
- D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the Engineer.

3.05 INSPECTION

- A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including the size, spacing and position of the reinforcement has been observed by the Engineer and the Engineer's release to proceed with the concreting has been obtained. The Engineer shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished his/her observations of the reinforcing steel.

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SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor and materials required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Concrete Formwork is included in Section 03 11 00.
- B. Concrete Reinforcement is included in Section 03 20 00.
- C. Concrete Accessories are included in Section 03 15 00.
- D. Concrete Finishes are included in Section 03 35 00.
- E. Grout is included in Section 03 60 00.
- F. Modifications and Repair to Concrete are included in section 03 01 32.

1.03 SUBMITTALS

- A. The contractor shall submit shop drawings and product data to the Engineer in accordance with the requirements of Section 01 33 00, Submittals.
- B. At a minimum, the submittals shall contain, but not be limited to, the following information to establish compliance with these specifications.
 - 1. Sources of cement, pozzolan and aggregates.
 - 2. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
 - 3. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
 - 4. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
 - 5. High-range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.
 - 6. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio,

concrete slump, type and manufacturer of cement. Provide either a. or b. below for each mix proposed.

- a. Standard deviation data for each proposed concrete mix based on statistical records.
- b. The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. The cylinder strength shall be the average of the 28-day cylinder strength test results for each mix. Provide results of 7- and 14-day tests if available.

7. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.
8. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.

C. Samples

1. Fine and coarse aggregates if requested by the Engineer.

D. Test Reports

1. Fine aggregates - sieve analysis, physical properties, and deleterious substance.
2. Coarse aggregates - sieve analysis, physical properties, and deleterious substances.
3. Cements - chemical analysis and physical properties for each type.
4. Pozzolans - chemical analysis and physical properties.
5. Proposed concrete mixes - compressive strength, slump and air content.

E. Certifications

1. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.
2. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.
3. Certify curing compound is suitable for use in contact with potable water after 30 days (non-toxic and free of taste or odor).

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete
7. ASTM C150 - Standard Specification for Portland Cement
8. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
9. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
10. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
11. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
12. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
13. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
14. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
15. ASTM C1017 - Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete.

B. American Concrete Institute (ACI).

1. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.
2. ACI 305 - Hot Weather Concreting.
3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
4. ACI 318 - Building Code Requirements for Structural Concrete.
5. ACI 350 - Environmental Engineering Concrete Structures.
6. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Reinforced concrete shall comply with ACI 318, the recommendations of ACI 350R and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section shall apply when conflicts exist.
- B. Only one source of cement and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.
- C. Well in advance of placing concrete, discuss with the Engineer the sources of individual materials and batched concrete proposed for use. Discuss placement methods, waterstops and curing. Propose methods of hot and cold weather concreting as required. Prior to the placement of any concrete containing a high-range water-reducing admixture (plasticizer), the Contractor, accompanied by the plasticizer

manufacturer, shall discuss the properties and techniques of batching and placing plasticized concrete.

- D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.
 - E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at his/her expense, make new acceptance tests of aggregates and establish new design mixes.
 - F. Testing of the following materials shall be furnished by Contractor to verify conformity with this Specification Section and the stated ASTM Standards.
 - 1. Fine aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.
 - 2. Coarse aggregates for conformity with ASTM C33 - sieve analysis, physical properties, and deleterious substances.
 - 3. Cements for conformity with ASTM C150 - chemical analysis and physical properties.
 - 4. Pozzolans for conformity with ASTM C618 - chemical analysis and physical properties.
 - 5. Proposed concrete mix designs - compressive strength, slump and air content.
 - G. Field testing and inspection services will be provided by the Contractor using a materials testing firm selected by the Owner. The cost of such work, except as specifically stated otherwise, shall be paid by the Contractor and reimbursed by the Owner under a cash allowance for testing. Testing of the following items shall be by the Owner to verify conformity with this Specification Section.
 - 1. Concrete placements - compressive strength (cylinders), compressive strength (cores), slump, and air content.
 - 2. Other materials or products that may come under question.
 - H. All materials incorporated in the work shall conform to accepted samples.
- 1.06 DELIVERY, STORAGE AND HANDLING
- A. Cement: Store in weather-tight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.
 - B. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-ft in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
 - C. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to uniform moisture content before using. Do not use frozen or partially frozen aggregates.

- D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- E. Pozzolan: Store in weather-tight buildings, bins or silos to provide protection from dampness and contamination.
- F. Sheet Curing Materials: Store in weather-tight buildings or off the ground and under cover.
- G. Liquid Curing Compounds: Store in closed containers.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

2.02 CEMENT

- A. U.S. made Portland cement complying with ASTM C150.
- B. Air entraining cements shall not be used.
- C. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work.

2.03 MATERIALS

- A. Materials shall comply with this Section and any applicable State or local requirements.
- B. Cement: The following cement type(s) shall be used:
 - 1. All Classes - Type I/II or Type II
- C. Fine Aggregate: Washed inert natural sand conforming to the requirements of ASTM C33.
- D. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be as listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions. Size numbers for the concrete mixes shall be as shown in Table 1 herein.
- E. Water: Potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

- F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures and shall be suitable for use in contact with potable water after 30 days of concrete curing.
1. Air-Entraining Admixture: The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
 2. Water-Reducing Agent: The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.
 3. High-Range Water-Reducer (Plasticizer): The admixture shall comply with ASTM C494, Type F and shall result in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cement ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportioning and mixing shall be in accordance with manufacturer's recommendations. Where walls are 14" thick or less and the wall height exceeds 12 ft a mix including a plasticizer must be used.
 4. Admixtures causing retarded or accelerated setting of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall be retarding or accelerating water reducing or high range water reducing admixtures.
- G. Pozzolan (Fly Ash): Pozzolan shall be Class C or Class F fly ash complying with ASTM C618 except the Loss on Ignition (LOI) shall be limited to 3 percent maximum.
- H. Sheet Curing Materials. Waterproof paper, polyethylene film or white burlap-polyethylene sheeting all complying with ASTM C171.
- I. Liquid Curing Compound. Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309, Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil. Curing compound shall be approved for use in contact with potable water after 30 days (non-toxic and free of taste or odor). Curing compound shall comply with Federal, State and local VOC limits.
- J. Integral Waterproofing Admixture
1. Concrete for water retaining structures shall include a Crystalline waterproofing admixture to the concrete mixes used in walls, fillets and slabs structures at manufacturer's recommended dosage rates.
 2. Products:
 - a. BASF Corporation; Rheomac 300D
 - b. Xypex Corporation; xypex Admix C-1000
 - c. Kryton International, Inc.; Krystol Internal Membrane (KIM)

2.04 MIXES

- A. Development of mix designs and testing shall be by an independent testing laboratory acceptable to the Engineer engaged by and at the expense of the Contractor.
- B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper placeability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.
- C. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7- and 28-day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.
- D. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraph.
- E. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.
 - 1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.
- F. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If a high-range water-reducer (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 4- to 8-in.
- G. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

**TABLE 1
CONCRETE MIX REQUIREMENTS**

Class	Design Strength(1)	Cement (2)	Fine Aggregate (2)	Coarse Aggregate (3)	Cementitious Content (4)
A	2500	C150 Type II	C33	57	440 min.
B	3000	C150 Type II	C33	57	480 min.
C	4500	C150 Type II	C33	57	560 min.
D	5000	C150 Type II	C33	57	600 min.

Class	W/CMRatio (5)	Fly Ash	AERange (6)	WR (7)	HRWR (8)	Slump Range Inches
A	0.62 max.	--	3.5 to 5	Yes	*	1-4
B	0.54 max.	--	4.5 to 7.5	Yes	*	1-3
C	0.42 max.	25% max	4.5 to 7.5	Yes	*	3-5
D	0.40 max.	--	4.5 to 7.5	Yes	*	3-5

NOTES:

- Minimum compressive strength in psi at 28 days
- ASTM designation
- Size Number in ASTM C33
- Cementitious content in lbs/cu yd
- W/Cm is Water-Cementitious ratio by weight
- AE is percent air-entrainment
- WR is water-reducer admixture
- HRWR is high-range water-reducer admixture
- HRWR used at contractor's option except where walls are 14" thick or less and the wall height exceeds 12 ft a mix including a plasticizer must be used.

PART 3 - EXECUTION

3.01 MEASURING MATERIALS

- A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, water and admixtures as specified and shall be produced by a plant acceptable to the Engineer. All constituents, including admixtures, shall be batched at the plant except a high-range water-reducer may also be added in the field.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within 1 year of use.
- C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.

- D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
 - 1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
 - 2. Inject multiple admixtures separately during the batching sequence.

3.02 MIXING AND TRANSPORTING

- A. Batch plants shall have a current NRMCA Certification or equal.
- B. Concrete shall be ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- C. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.
- D. Keep the water tank valve on each transit truck locked at all times. Any addition of water above the appropriate W/Cm ratio must be directed by the Engineer. Added water shall be incorporated by additional mixing of at least 35 revolutions. All added water shall be metered and the amount of water added shall be shown on each delivery ticket.
- E. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.
- F. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- G. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.
- H. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
- I. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall provide a printed record of the weight of cement and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day

batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.

J. Temperature and Mixing Time Control

1. In cold weather, do not allow the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms to drop below 40 degrees F.
2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
4. The maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms shall not exceed the values shown in Table 2.

**TABLE 2
MAXIMUM TIME TO DISCHARGE OF CONCRETE**

<u>Air or Concrete Temperature (whichever is higher)</u>	<u>Maximum Time</u>
80 to 90 Degree F (27 to 32 Degree C)	60 minutes
70 to 79 Degree F (21 to 26 Degree C)	90 minutes
40 to 69 Degree F (5 to 20 Degree C)	90 minutes

If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

3.03 CONCRETE APPEARANCE

- A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:
1. The gradation of aggregate.
 2. The proportion of fine and coarse aggregate.
 3. The percentage of entrained air, within the allowable limits.
- B. Concrete for the work shall provide a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete, when viewed in good lighting from 10-ft away, shall be pleasing in appearance, and at 20-ft shall show no visible defects.

3.04 PLACING AND COMPACTING

- A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.
2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.
4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.
5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.
6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.
7. Slabs
 - a. After suitable bulkheads, screeds and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edge form, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.
 - b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bullfloats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.
 - c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

- a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12- to 24-in lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 4-ft.

9. Underwater concreting shall be performed in conformity with the recommendations of ACI 304R. The tremie system shall be used to place underwater concrete. Tremie pipes shall be in the range of 8 to 12-in in diameter and be spaced at not more than 16-ft on centers nor more than 8-ft from an end form. Where concrete is being placed around a pipe, there shall be at least one tremie pipe on each side of each pipe. Where the tremie system is not practical, direct pumped concrete for underwater placement may be used subject to approval of the system including details by the Engineer.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Puddling, spading, etc., shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.
2. All concrete shall be placed and compacted with mechanical vibrators. The number, type and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.
3. A minimum frequency of 7000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.
4. Concrete Slabs: Concrete for slabs less than 8-in thick shall be consolidated with vibrating screeds; slabs 8 to 12-in thick shall be compacted with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.
5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:
 - a. Frequency returns to normal.
 - b. Surface appears liquefied, flattened and glistening.

- c. Trapped air ceases to rise.
- d. Coarse aggregate has blended into surface but has not disappeared.

3.05 CURING AND PROTECTION

A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.

B. Curing Methods

1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Curing methods to be used are as follows:
 - a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
 - b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
 - c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.
2. Specified applications of curing methods.
 - a. Slabs for Water Containment Structures: Water curing only.
 - b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
 - c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.
 - d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.
 - e. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cured or liquid membrane cured if forms are removed prior to 7 days. Exposed horizontal surfaces of formed walls or columns shall be water cured for 7 days or until next placement of concrete is made.
 - f. Surfaces of Concrete Joints: Water cured or sheet material cured.

- C. Finished surfaces and slabs shall be protected from the direct rays of the sun to prevent checking and crazing.
- D. Cold Weather Concreting:
1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.
 2. Cold weather concreting shall conform to ACI 306.1 and the additional requirements specified herein. Temperatures at the concrete placement shall be recorded at 12-hour intervals (minimum).
 3. Discuss a cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.
 4. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.
 - a. Degree-days are defined as the total number of 24-hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (eg: 5 days at an average 70 degrees F = 350 degree-days).
 - b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
 5. Salt, manure or other chemicals shall not be used for protection.
 6. The protection period for concrete being water cured shall not be terminated during cold weather until at least 24 hours after water curing has been terminated.
- E. Hot Weather Concreting
1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr).
 2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.
 - a. Temperature of concrete being placed shall not exceed 90 degrees F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be

such that it will cause no difficulties from loss of slump, flash set or cold joints.

- b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the job and to provide vibration immediately after placement.
 - c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.
3. Discuss with the Engineer a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

3.06 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 70 percent of its specified design strength for beams and slabs and at least 30 percent of its specified design strength for walls and vertical surfaces, nor before reaching the following number of day-degrees of curing (whichever is the longer).

TABLE 3

MINIMUM TIME TO FORM REMOVAL

Forms for	Degree Days
Beams and slabs	500
Walls and vertical surfaces	100

- B. Shores shall not be removed until the concrete has attained at least 70 percent of its specified design strength and also sufficient strength to support safely its own weight and construction live loads.

3.07 INSPECTION AND FIELD TESTING

- A. The batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of his/her readiness to proceed at least 24 hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.
- B. Sets of field control cylinder specimens will be taken by the Engineer (or inspector) during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 100 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls.
 - 1. A "set" of test cylinders consists of seven cylinders: two to be tested at 7 days, three to be tested and their strengths averaged at 28 days and two to be tested and their strengths averaged at 56 days. The seventh may be used for a

special test at 3 days or to verify strength after 28 days if 28-day test results are low. Where required, additional cylinders may be taken by the Contractor at the Contractor's expense.

2. When the average 28-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7-day strengths (where proper relation between seven and 28-day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.
- C. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations and furnish material and labor required for the purpose of taking concrete cylinder samples. All shipping of specimens will be paid for by the Owner. Curing boxes shall be acceptable to the Engineer.
- D. Slump tests will be made in the field immediately prior to placing the concrete. Such tests shall be made in accordance with ASTM C143. If the slump is greater the specified range, the concrete shall be rejected.
- E. Air Content: Test for air content shall be made on fresh concrete samples. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173.
- F. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.
- G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes. The work of cutting and testing the cores will be at the expense of the Owner.
- H. See Specification Section 03 90 00 for Leakage Testing of Water Retaining Structures.

3.08 FAILURE TO MEET REQUIREMENTS

- A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer shall have the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet

strength requirements the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.

- B. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.

3.09 PATCHING AND REPAIRS

- A. It is the intent of this Section to require quality work including adequate forming, proper mixture and placement of concrete and curing so completed concrete surfaces will require no patching.
- B. Defective concrete and honeycombed areas as determined by the Engineer shall be repaired as specified by the Engineer.
- C. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects which do not impair structural strength shall be repaired. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.
- D. Immediately after removal of forms remove plugs and break off metal ties as required by Section 03 11 00. Promptly fill holes upon stripping. See Section 03 11 00 for additional requirements.
- E. When patching exposed surfaces the same source of cement and sand as used in the parent concrete shall be employed. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.10 SCHEDULE

- A. The following (Table 4) are the general applications for the various concrete classes and design strengths:

**TABLE 4
CONCRETE SCHEDULE**

Class	Design Strength (psi)	Description
A	2,500	Concrete fill and duct encasement
B	3,000	Concrete overlay slabs and pavement
C	4,500	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams and all other structural concrete
D	5,000	Prestressed concrete

- END OF SECTION -

SECTION 03 35 00
CONCRETE FINISHES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and finish cast-in-place concrete surfaces as shown on the Drawings and as specified herein.
- B. Additional applied finishes:
 - 1. The interior of the new clearwell will not require additional applied finishes, such as a concrete sealer, or paint.
 - 2. The exterior of the new clearwell will require two coats of paint only where exposed, on the roof and on the walls, beginning two feet below finished grade.

1.02 RELATED WORK

- A. Concrete Formwork is included in Section 03 11 00.
- B. Cast-In-Place Concrete is included in Section 03 30 00.
- C. Grout is included in Section 03 60 00.
- D. Paint is included in Section 09 91 00.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01 33 00, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Concrete sealer. Confirmation that the sealer is compatible with additionally applied coatings shall also be submitted.

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Finishes
 - 1. For concrete which will receive additional applied finishes or materials, the surface finish specified is required for the proper application of the specified manufacturer's products. Where alternate products are approved for use, determine if changes in finishes are required and provide the proper finishes to receive these products.

2. Changes in finishes made to accommodate products different from those specified shall be performed at no additional cost to the Owner. Submit the proposed new finishes and their construction methods to the Engineer for approval.
3. Services of Manufacturer's Representative
 - a. Make available at no extra cost to the Owner, upon 72 hours notification, the services of a qualified field representative of the manufacturer of curing compound, sealer or hardener to instruct the user on the proper application of the product under prevailing job conditions.

PART 2 — PRODUCTS

2.01 MATERIALS

- A. Chemical hardener shall be Lapidolith by Sonneborn; Hornolith by A.C. Horn; Penalith by W.R. Meadows or equal fluosilicate base material.
- B. Concrete sealer shall be "MasterKure CC 180 WB", by Master Builders Solutions, Shakopee, MN or equal.

PART 3 — EXECUTION

3.01 FORMED SURFACES

- A. Forms shall not be removed before the requirements of Section 03 30 00, have been satisfied.
- B. Exercise care to prevent damaging edges or obliterating the lines of chamfers, rustications or corners when removing the forms or performing any other work adjacent thereto.
- C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.
- D. Rough-Form Finish
 1. Immediately after stripping forms and before concrete has changed color, carefully remove all fins and projections.
 2. Promptly fill holes left by tie cones and defects as specified in Section 03 30 00.
- E. Rubbed Finish
 1. Immediately upon stripping forms and before concrete has changed color, carefully remove all fins. Provide a Portland cement based rubbed finish using PAVECRETE as manufactured by Lyons Manufacturing, Inc. or approved equal.
 2. It is the intent of this finish to provide a surface that is uniform in appearance with no blemishes, imperfections, discolorations, etc.
- F. Abrasive Blast Finish
 1. Coordinate with Rubbed Finish application. Do not begin until Rubbed Finish operation is complete or before concrete has reached minimum 7-day strength. The Rubbed Finish application may be deleted by the Engineer if the unfinished

concrete surface is of superior quality. Apply the abrasive blast finish only where indicated on Drawings.

2. Prepare a sample area of minimum 4-ft high by 16-ft wide Blast Finish as directed by Engineer on a portion of new wall construction which will not be exposed in the final work. Sample area shall contain a variety of finishes obtained with different nozzles, nozzle pressures, grit materials and blasting techniques for selection by Engineer. Final accepted sample shall remain exposed until completion of all Blast Finish operations.
3. Blast finish operation shall meet all regulatory agency requirements. Blast Finish contractor shall be responsible for obtaining all required permits and/or licenses.
4. Perform abrasive blast finishing in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns or variances in depths of blast as present on the accepted sample.
5. Use an abrasive grit of proper type and gradation as well as equipment and technique to expose aggregate and surrounding matrix surfaces as follows:
 - a. Medium: Generally expose coarse aggregate - 1/4-in to 3/8-in reveal.
6. Abrasive blast corners and edge of patterns carefully, using back-up boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure and blasting techniques required to match Architect's samples.
7. Upon completion of the Blast Finish operation, thoroughly flush finished surfaces with clean clear water to remove residual dust and grit. Allow to air dry until curing of concrete is complete.
8. After the concrete has cured for a minimum of 28 days, apply a clear acrylic sealer as directed by manufacturer.

3.02 FLOORS AND SLABS

A. Floated Finish

1. Machine Floating

- a. Screed floors and slabs with straightedges to the established grades shown on the Drawings. Immediately after final screeding, a dry cement/sand shake in the proportion of two sacks of Portland cement to 350 lbs of coarse natural concrete sand shall be sprinkled evenly over the surface at the rate of approximately 500 lbs /1,000 sq ft of floor. Do not sprinkle neat, dry cement on the surface.
- b. The application of the cement/sand shake may be eliminated at the discretion of the Engineer if the base slab concrete exhibits adequate fattiness and homogeneity and the need is not indicated. When the concrete has hardened sufficiently to support the weight of a power float without its digging into or disrupting the level surface, thoroughly float the shake into the surface with a heavy revolving disc type power compacting machine capable of providing a 200 lb compaction force distributed over a 24-in diameter disc.
- c. Start floating along walls and around columns and then move systematically across the surface leaving a matte finish.

- d. The compacting machine shall be the "Kelly Power Float with Compaction Control" as manufactured by Kelley Industries of SSP Construction Equipment Inc., Pomona, CA or equal. Troweling machines equipped with float (shoe) blades that are slipped over the trowel blades may be used for floating. Floating with a troweling machine equipped with normal trowel blades will not be permitted. The use of any floating or troweling machine which has a water attachment for wetting the concrete surface during finishing will not be permitted.
2. Hand Floating
 - a. In lieu of power floating, small areas may be compacted by hand floating. The dry cement/sand shake previously specified shall be used unless specifically eliminated by the Engineer. Screed the floors and slabs with straightedges to the established grades shown on the Drawings. While the concrete is still green, but sufficiently hardened to support a finisher and kneeboards with no more than 1/4-in indentation, wood float to a true, even plane with no coarse aggregate visible. Use sufficient pressure on the wood floats to bring moisture to the surface.
 3. Finishing Tolerances
 - a. Level floors and slabs to a tolerance of plus or minus 1/8-in when checked with a 10-ft straightedge placed anywhere on the slab in any direction. Where drains occur, pitch floors to drains such that there are no low spots left undrained. Failure to meet either of the above requirements shall be cause for removal, grinding, or other correction as directed by the Engineer.
- B. Broom Finish
1. Screed slabs with straightedges to the established grades indicated on the Drawings. When the concrete has stiffened sufficiently to maintain small surface indentations, draw a stiff bristle broom lightly across the surface in the direction of drainage, or, in the case of walks and stairs, perpendicular to the direction of traffic to provide a non-slip surface.
- C. Steel Trowel Finish
1. Finish concrete as specified in Paragraph 3.04 and 3.05. Then, hand steel trowel to a perfectly smooth hard even finish free from high or low spots or other defects.
- D. Concrete Sealer
1. Prepare and seal surfaces indicated on the room finish schedule to receive a sealer as follows:
 - a. Finish concrete as specified in the preceding paragraphs and in accordance with the Schedule in Paragraph 3.05 below.
 - b. Newly Placed Concrete: Surface must be sound and properly finished. Surface is application-ready when it is damp but not wet and can no longer be marred by walking workmen.
 - c. Newly-Cured Bare Concrete: Level any spots gouged out by trades. Remove all dirt, dust, droppage, oil, grease, asphalt and foreign matter. Cleanse with caustics and detergents as required. Rinse thoroughly and allow to dry so that surface is no more than damp, and not wet.

- d. Aged Concrete: Restore surface soundness by patching, grouting, filling cracks and holes, etc. Surface must also be free of any dust, dirt and other foreign matter. Use power tools and/or strippers to remove any incompatible sealers or coatings. Cleanse as required, following the procedure indicated under cured concrete.
- e. Methods: Apply sealer so as to form a continuous, uniform film by spray, soft-bristle pushbroom, long-nap roller or lambswool applicator. Ordinary garden-type sprayers, using neoprene hose, are recommended for best results.
- f. Applications: For curing only, apply first coat evenly and uniformly as soon as possible after final finishing at the rate of 200 to 400 sq ft per gallon. Apply second coat when all trades are completed and structure is ready for occupancy at the rate of 400 to 600 sq ft per gallon.
- g. To meet guarantee and to seal and dustproof, two coats are required. For sealing new concrete, both coats shall be applied full-strength. On aged concrete, when renovating, dustproofing and sealing, the first coat should be thinned 10 to 15 percent with reducer per manufacturer's directions.

3.03 CONCRETE RECEIVING CHEMICAL HARDENER

- A. After 28 days, minimum, concrete cure, apply chemical hardener in three applications to a minimum total coverage of the undiluted chemical of 100 sq ft per gallon and in accordance with manufacturer's recommendations as reviewed.

3.04 APPROVAL OF FINISHES

- A. All concrete surfaces, when finished, will be inspected by the Engineer.
- B. Surfaces which, in the opinion of the Engineer, are unsatisfactory shall be refinished or reworked.
- C. After finishing horizontal surfaces, regardless of the finishing procedure specified, the concrete shall be cured in compliance with Section 03 30 00 unless otherwise directed by the Engineer.

3.05 SCHEDULE OF FINISHES

- A. Concrete shall be finished as specified either to remain as natural concrete to receive an additional applied finish or material under another section.
- B. Concrete for the following conditions shall be finished as noted on the Drawings and as further specified herein:
 - 1. Concrete to Receive Dampproofing: Rough-form finish. See Paragraph 3.01D above.
 - 2. Concrete Not Exposed to View and Not Scheduled to Receive an Additional Applied Finish or Material: Rough-form finish. See Paragraph 3.01D above.
 - 3. Exterior Vertical Concrete Above Grade Exposed to View: Rubbed finish. See Paragraph 3.01E above.

4. Interior Vertical Concrete Exposed to View Except in Water Containment Areas: Rubbed finish. See Paragraph 3.01E above.
5. Vertical Concrete in Water Containment Areas. Rubbed finish on exposed surfaces and extending to two feet below normal operating water level: Rough-form finish on remainder of submerged areas. See Paragraphs 3.01E and 3.01D above.
6. Interior and Exterior Underside of Concrete Exposed to View: Rubbed finish. See Paragraph 3.01E above.
7. Exterior surfaces exposed to view and indicated to have an abrasive blast finish. See Paragraph 3.01F above.
8. Interior or Exterior Horizontal Concrete not Requiring Floor Hardener or Sealer: Floated finish. See Paragraph 3.02A above.
9. Concrete for Exterior Walks, Interior and Exterior Stairs: Broomed finish perpendicular to direction of traffic. See Paragraph 3.02B above.
10. Concrete Slabs on Which Process Liquids Flow or In Contact with Sludge: Steel trowel finish. See Paragraph 3.02C above.
11. Concrete to Receive Hardener: See Paragraph 3.03 above.
12. Concrete to Receive Floor Sealer: See Paragraph 3.02D above.
13. Concrete tank bottoms to be covered with grout: See Section 03 60 00.

- END OF SECTION -

SECTION 03 60 00

GROUTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Formwork is included in Section 03 11 00.
- B. Concrete Reinforcement is included in Section 03 20 00.
- C. Concrete Accessories are included in Section 03 15 00.
- D. Cast-in-Place Concrete is included in Section 03 30 00.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01 33 00, shop drawings and product data showing materials of construction and details of installation for:
 - 1. Commercially manufactured nonshrink cementitious grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.
 - 2. Commercially manufactured nonshrink epoxy grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM standards and Material Safety Data Sheet.
 - 3. Cement grout. The submittal shall include the type and brand of the cement, the gradation of the fine aggregate, product data on any proposed admixtures and the proposed mix of the grout.
 - 4. Concrete grout. The submittal shall include data as required for concrete as delineated in Section 03 30 00 and for fiber reinforcement as delineated in Section 03 20 00. This includes the mix design, constituent quantities per cubic yard and the water/cement ratio.
- B. Laboratory Test Reports
 - 1. Submit laboratory test data as required under Section 03 30 00 for concrete to be used as concrete grout.
- C. Certifications
 - 1. Certify that commercially manufactured grout products and concrete grout admixtures are suitable for use in contact with potable water after 30 days curing.

D. Qualifications

1. Grout manufacturers shall submit documentation that they have at least 10 years' experience in the production and use of the proposed grouts which they will supply.

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts and Monolithic Surfacing and Polymer Concretes
2. ASTM C579 - Standard Test Method for Compressive Strength of Chemical Resistant Mortars, Grouts and Monolithic Surfacing and Polymer Concretes
3. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
4. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

B. U.S. Army Corps of Engineers Standard (CRD)

1. CRD C-621 - Corps of Engineers Specification for Nonshrink Grout

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturer shall have a minimum of 10 years' experience in the production and use of the type of grout proposed for the work.

B. Pre-installation Conference

1. Well in advance of grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing and curing procedures for each product proposed for use. Parties concerned with grouting shall be notified of the meeting at least 10 days prior to its scheduled date.

C. Services of Manufacturer's Representative

1. A qualified field technician of the nonshrink grout manufacturer, specifically trained in the installation of the products, shall attend the pre-installation conference and shall be present for the initial installation of each type of nonshrink grout. Additional services shall also be provided, as required, to correct installation problems.

D. Field Testing

1. All field testing and inspection services required shall be provided by the Owner. The Contractor shall assist in the sampling of materials and shall provide any ladders, platforms, etc., for access to the work. The methods of testing shall comply in detail with the applicable ASTM Standards.

2. The field testing of Concrete Grout shall be as specified for concrete in Section 03 30 00.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.
- B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 6 months or the manufacturer's recommended storage time, whichever is less.
- C. Material which becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Owner.
- D. Nonshrink cement-based grouts shall be delivered as preblended, prepackaged mixes requiring only the addition of water.
- E. Nonshrink epoxy grouts shall be delivered as premeasured, prepackaged, three component systems requiring only blending as directed by the manufacturer.

1.07 DEFINITIONS

- A. Nonshrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

PART 2 -- PRODUCTS

2.01 GENERAL

- A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.
- B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

- A. Nonshrink Cementitious Grout
 1. Nonshrink cementitious grouts shall meet or exceed the requirements of ASTM C1107, Grades B or C and CRD C-621. Grouts shall be Portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and shall require only the addition of water. Nonshrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

- a. General purpose nonshrink cementitious grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by Master Builders, Inc.; Gilco Construction Grout by Gifford Hill & Co.; Euco NS by The Euclid Chemical Co.; NBEC Grout by U. S. Grout Corp. or equal.
 - b. Flowable (Precision) nonshrink cementitious grout shall conform to the standards stated above and shall be Masterflow 928 by Master Builders, Inc.; Hi-Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Supreme Grout by Gifford Hill & Co.; Five Star Grout by U. S. Grout Corp. or equal.
- B. Nonshrink Epoxy Grout
1. Nonshrink epoxy-based grout shall be a pre-proportioned, three component, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 14,000 psi in 7 days when tested in conformity with ASTM D695 and have a maximum thermal expansion of 30×10^{-6} when tested in conformity with ASTM C531. The grout shall be Ceilcote 648 CP by Master Builders Inc.; Five Star Epoxy Grout by U.S. Grout Corp.; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout by the Euclid Chemical Co. or equal.
- C. Cement Grout
1. Cement grouts shall be a mixture of one-part Portland cement conforming to ASTM C150, Types I, II, or III and 1 to 2 parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.
- D. Concrete Grout
1. Concrete grout shall conform to the requirements of Section 03 30 00 except as specified herein. It shall be proportioned with cement, coarse and fine aggregates, water, water reducer and air entraining agent to produce a mix having an average strength of 2900 psi at 28 days, or 2500 psi nominal strength. Coarse aggregate size shall be 1/2-in maximum. Slump should not exceed 5-in and should be as low as practical yet still retain sufficient workability.
 2. Synthetic reinforcing fibers as specified in Section 03 20 00 shall be added to the concrete grout mix at the rate of 1.5 lbs of fibers per cubic yard of grout. Fibers shall be added from the manufacturer's premeasured bags and according to the manufacturer's recommendations in a manner which will ensure complete dispersion of the fiber bundles as single monofilaments within the concrete grout.
- E. Water
1. Potable water, free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

PART 3 — EXECUTION

3.01 PREPARATION

- A. Grout shall be placed over cured concrete which has attained its full design strength unless otherwise approved by the Engineer.
- B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, grease, oil, curing compounds, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.
- C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to a minimum of ¼" amplitude or provide a raked finish in order to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.
 - 1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the air line to prevent oil from being blown onto the surface.
- D. Remove all loose rust, oil or other deleterious substances from metal embedments or bottom of baseplates prior to the installation of the grout.
- E. Concrete surfaces shall be washed clean and then kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, or other method acceptable to the Engineer. Upon completion of the 24-hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when approved by the Engineer for each specific location of grout installation.
- F. Epoxy-based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.
- G. Construct grout forms or other leakproof containment as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer. Forms shall be of adequate strength, securely anchored in place and shored to resist the forces imposed by the grout and its placement.
 - 1. Forms for epoxy grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.
- H. Level and align the structural or equipment bearing plates in accordance with the structural requirements and the recommendations of the equipment manufacturer.
- I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be

prevented from bonding to the grout by appropriate bond breaking coatings and removed after grouting unless otherwise approved by the Engineer.

3.02 INSTALLATION – GENERAL

- A. Mix, apply, and cure products in strict compliance with the manufacturer's recommendations and this Section.
- B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.
- C. Maintain temperatures of the foundation plate, supporting concrete, and grout between 40- and 90-degrees F during grouting and for at least 24 hours thereafter or as recommended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of baseplates and grout during the curing period.
- D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 60- and 90-degrees F range.
- E. Install grout in a manner which will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.
- F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION: CEMENT GROUTS AND NONSHRINK CEMENTITIOUS GROUTS

- A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.
- B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Pre-wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.
- C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.
- D. Place grout into the designated areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner which will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
- E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (retemper) after initial stiffening.
- F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree angle from the lower edge of bearing plate unless otherwise approved by the Engineer. Finish this surface with a wood float (brush) finish.

- G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION - NONSHRINK EPOXY GROUTS

- A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Mix full batches only to maintain proper proportions of resin, hardener and aggregate.
- B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.
- C. Place grout into the designated areas in a manner which will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.
- D. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.
- E. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.
- F. Epoxy grouts are self-curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

3.05 INSTALLATION - CONCRETE GROUT

- A. Screed underlying concrete to the grade shown on the Drawings. Prepare the surface according to 3.01B. Protect and keep the surface clean until placement of concrete grout.
- B. Remove the debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Wash the tank slab using a strong jet of water. Flushing of debris into tank drain lines will not be permitted.
- C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout. Saturation may be maintained by ponding, by the use of soaker hoses, or by other methods acceptable to the Engineer. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8-in thick cement paste. (A bonding grout composed of 1 part Portland cement, 1.5 parts fine sand, an approved bonding admixture

and water, mixed to achieve the consistency of thick paint, may be substituted for the cement slurry.)

- D. Place concrete grout to final grade using the scraper mechanism as a guide for surface elevation and to ensure high and low spots are eliminated. Unless specifically approved by the equipment manufacturer, mechanical scraper mechanisms shall not be used as a finishing machine or screed.
- E. Provide grout control joints as indicated on the Drawings.
- F. Finish and cure the concrete grout as specified for cast-in-place concrete.

3.06 SCHEDULE

- A. The following list indicates where the particular types of grout are to be used:
- B. General purpose nonshrink cementitious grout: Use at all locations where non shrink grout is called for on the plans except for base plates greater in area than 3-ft wide by 3-ft long and except for the setting of anchor rods, anchor bolts or reinforcing steel in concrete.
- C. Flowable nonshrink cementitious grout: Use under all base plates greater in area than 3-ft by 3-ft. Use at all locations indicated to receive flowable nonshrink grout by the Drawings. The Contractor, at his/her option and convenience, may also substitute flowable nonshrink grout for general purpose nonshrink cementitious grout.
- D. Nonshrink epoxy grout: Use for the setting of anchor rods, anchor bolts and reinforcing steel in concrete and for all locations specifically indicated to receive epoxy grout.
- E. Cement grout: Cement grout may be used for grouting of incidental base plates for structural and miscellaneous steel such as post base plates for platforms, base plates for beams, etc. It shall not be used when nonshrink grout is specifically called for on the Drawings or for grouting of primary structural steel members such as columns and girders.
- F. Concrete grout: Use for overlaying the base concrete under scraper mechanisms of clarifiers to allow more control in placing the surface grade.

- END OF SECTION -

SECTION 03 90 00

LEAKAGE TESTING OF WATER RETAINING STRUCTURES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Water tightness testing of reinforced concrete water retaining structures. Furnish all labor, materials and incidentals required and perform watertightness testing of liquid-containing structures as listed herein and all retesting until the structures meet the requirements as specified herein.

1.02 RELATED WORKS

- A. Concrete is included in Division 03.

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 350.1-10 – Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide potable water, piping, and equipment required to test concrete structures for leakage.

PART 3 – EXECUTION

3.01 GENERAL

- A. Hydrostatically test reinforced concrete structures which will contain water to requirements specified below and are free of detectable leaks.
- B. Do not start leak testing or cleaning of surfaces until concrete is cured and joint sealants have set and cured a minimum of 14 days.
- C. Conduct testing before backfill is placed against walls.
- D. Prior to testing, clean exposed surfaces by thorough hosing, and remove surface laitance and loose matter from walls and slabs. Remove wash water and debris by means other than washing through plant piping.

3.02 TEST PROCEDURE

- A. Fill structure to be tested to the normal operating liquid level. Filling rate shall not exceed 4 feet of water per hour and shall be at continuous uniform rate with continuous monitoring.
- B. The exterior surface of the tank shall be monitored for flowing leaks. Repair any flowing leaks which occur before continuing filling.
- C. The water shall be kept at the test level for at least three days prior to the actual test.
- D. Measure the vertical distance to the water surface from a fixed point on the tank above the water surface. Record measurements at 12-hour intervals. The test shall be performed for a minimum of 3 days and shall be at least the theoretical time required to lower the water surface 3/8" assuming a loss of water at a rate of 0.125% of the normal volume over a 24-hour period. The test need not exceed 5 days.
- E. A drop of the water surface exceeding 0.0125% of the normal volume of contained liquid over a 24-hour period will be considered failing.
- F. The structure will have also been considered to have failed the test if flowing or seeping water is observed, or if moisture can be transferred to a dry hand from the exterior surface.
- G. Independently measure change in water volume due to evaporation and precipitation using a 24-inch-deep white, watertight container not less than 10 square feet of surface area. Position the container to experience environmental conditions similar to the structure being tested. The volume change of the structure shall be corrected based on the water volume change in the sample container.
- H. Failing tanks which exhibit no visible signs of leaking or seepage may be permitted to be immediately retested.
- I. Failing tanks will be drained, repaired, and retested until the tank has met the test requirements.
- J. Methods for repairing concrete are described in section 03 01 32.
- K. Repairs and retesting of tanks shall be accomplished at no additional cost to the Owner.

- END OF SECTION -

SECTION 05 01 00

METAL MATERIALS

PART 1 – GENERAL

1.01 SCOPE

- A. Metal materials not otherwise specified shall conform to the requirements of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Materials for fasteners are included in Section 05 05 23, Metal Fastening.
- B. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. ASTM A36 Standard Specification for Structural Steel
- B. ASTM A47 Standard Specification for Malleable Iron Castings
- C. ASTM A48 Standard Specification for Gray Iron Castings
- D. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- E. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- F. ASTM A276 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
- G. ASTM A307 Standard Specification for Carbon Steel Externally Threaded Standard Fasteners
- H. ASTM A446 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality
- I. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- J. ASTM A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- K. ASTM A529 Standard Specification for Structural Steel with 42 000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)
- L. ASTM A536 Standard Specification for Ductile Iron Castings

- M. ASTM A570 Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
- N. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- O. ASTM A992 Standard Specification for Structural Steel Shapes
- P. ASTM A666 Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications
- Q. ASTM A1085 Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
- R. ASTM B26 Standard Specification for Aluminum-Alloy Sand Castings
- S. ASTM B85 Standard Specification for Aluminum-Alloy Die Castings
- T. ASTM B108 Standard Specification for Aluminum-Alloy Permanent Mold Castings
- U. ASTM B138 Standard Specification for Manganese Bronze Rod, Bar, and Shapes
- V. ASTM B209 Standard Specification for Aluminum-Alloy Sheet and Plate
- W. ASTM B221 Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
- X. ASTM B308 Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded
- Y. ASTM B574 Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod
- Z. ASTM F468 Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
- AA. ASTM F593 Standard Specification for Stainless Steel Fasteners

1.04 SUBMITTALS

- A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.

1.05 QUALITY ASSURANCE

- A. Owner may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by the Owner. If the material does not conform to the Specifications, the cost of testing shall be paid by the Contractor and all materials not in conformance as determined by the Engineer shall be replaced by the Contractor at no additional cost to the Owner. In lieu of replacing materials the Contractor may request further testing to determine conformance, but any such testing shall be paid for by the Contractor regardless of outcome of such testing.

PART 2 – PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

- | | | |
|----|---|-----------------------|
| 1. | Steel W Shapes | A992 |
| 2. | Steel HP Shapes | A572 Grade 50 |
| 3. | Steel M, S, C, and MC shapes and Angles, Bars, and Plates | A36 |
| 4. | Rods | F 1554 Grade 36 |
| 5. | Pipe - Structural Use | A53 Grade B |
| 6. | Hollow Structural Sections | A500 Grade C or A1085 |
| 7. | Cold-Formed Steel Framing | A 653 |

2.02 STAINLESS STEEL

A. All stainless steel fabrications exposed to underwater service shall be Type 316. All other stainless steel fabrications shall be Type 304, unless noted otherwise.

B. Material types and ASTM designations are listed below:

- | | | |
|----|-------------------------|---------------------------|
| 1. | Plates and Sheets | ASTM A167 or A666 Grade A |
| 2. | Structural Shapes | ASTM A276 |
| 3. | Fasteners (Bolts, etc.) | ASTM F593 |

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

- | | | |
|----|---------------------------------|------------------------|
| 1. | Structural Shapes | ASTM B308 |
| 2. | Castings | ASTM B26, B85, or B108 |
| 3. | Extruded Bars | ASTM B221 - Alloy 6061 |
| 4. | Extruded Rods, Shapes and Tubes | ASTM B221 - Alloy 6063 |
| 5. | Plates | ASTM B209 - Alloy 6061 |
| 6. | Sheets | ASTM B221 - Alloy 3003 |

C. All aluminum structural members shall conform to the requirements of Section 05 14 00, Structural Aluminum.

D. All aluminum shall be provided with mill finish unless otherwise noted.

- E. Where bolted connections are indicated, aluminum shall be fastened with stainless steel bolts.
- F. Aluminum in contact with dissimilar materials shall be insulated with an approved dielectric.

2.04 CAST IRON

- A. Material types and ASTM designations are listed below:

- 1. Gray ASTM A48 Class 30B
- 2. Malleable ASTM A47
- 3. Ductile ASTM A536 Grade 60-40-18

2.05 BRONZE

- A. Material types and ASTM designations are listed below:

- 1. Rods, Bars and Sheets ASTM B138 - Alloy B Soft

2.06 HASTELLOY

- A. All Hastelloy shall be Alloy C-276.

PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

- | | | |
|-----|---------------------|---|
| 13. | ASTM A572/A572M-94C | Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50 |
| 14. | ASTM A36 | Standard Specification for Carbon Structural Steel |
| 15. | ASTM A325 | Standard Specification for High-Strength Bolts for Structural Steel Joints |
| 16. | ASTM A489 | Standard Specification for Eyebolts |
| 17. | ASTM A490 | Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints |
| 18. | ASTM A563 | Standard Specifications for Carbon and Alloy Steel Nuts |
| 19. | ASTM D1785 | Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe |
| 20. | ASTM E488 | Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements |
| 21. | ASTM F436 | Standard Specification for Hardened Steel Washers |
| 22. | ASTM F467 | Standard Specification for Nonferrous Nuts for General Use |
| 23. | ASTM F593 | Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs |
| 24. | ASTM F594 | Standard Specification for Stainless Steel Nuts |
| 25. | ASTM F1554 | Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength |

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00, Submittals.
1. Shop Drawings providing the fastener's manufacturer and type and certification of the fastener's material and capacity.
 2. Anchor design calculations sealed by a Professional Engineer currently registered in the State of Georgia. Only required if design not shown on Contract Drawings.
 3. Manufacturer's installation instructions.
 4. Copy of valid certification for each person who is to perform field welding.

5. Certified weld inspection reports, when required.
6. Welding procedures.
7. Installer qualifications.
8. Certification of Installer Training.
9. Inspection Reports.
10. Results of Anchor Proof Testing.

1.05 QUALITY ASSURANCE

- A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project.
- B. Installer Qualifications: All concrete anchors shall be installed by an Installer with at least three years of experience performing similar installations. Concrete adhesive anchor installer shall be certified as an Adhesive Anchor Installer in accordance with ACI-CRSI Adhesive Anchor Installation Certification Program.
- C. Installer Training: For concrete adhesive anchors, conduct a thorough training with the manufacturer or the manufacturer's representative for the Installer on the project. Training shall consist of a review of the complete installation process to include but not be limited to the following:
 1. Hole drilling procedure.
 2. Hole preparation and cleaning technique.
 3. Adhesive injection technique and dispenser training/maintenance.
 4. Concrete adhesive anchor preparation and installation.
 5. Proof loading/torquing.
- D. All steel welding shall be performed by welders certified in accordance with AWS D1.1. All aluminum welding shall be performed by welders certified in accordance with AWS D1.2. All stainless steel welding shall be performed by welders certified in accordance with AWS D1.6. Certifications of field welders shall be submitted prior to performing any field welds.
- E. Welds and high strength bolts used in connections of structural steel will be visually inspected in accordance with Paragraph 3.03.
- F. The Owner may engage an independent testing agency to perform testing of welded connections and to prepare test reports in accordance with AWS. Inadequate welds shall be corrected or redone and retested to the satisfaction of the Engineer and/or an acceptable independent testing laboratory, at no additional cost to the Owner.

- G. Provide a welding procedure for each type and thickness of weld. For welds that are not prequalified, include a Performance Qualification Report. The welding procedure shall be given to each welder performing the weld. The welding procedure shall follow the format in Annex E of AWS D1.1 with relevant information presented.

PART 2 – PRODUCTS

2.01 ANCHOR RODS (ANCHOR BOLTS)

- A. Anchor rods shall conform to ASTM F1554 Grade 36 except where stainless steel or other approved anchor rods are shown on the Drawings. Anchor rods shall have hexagonal heads and shall be supplied with hexagonal nuts meeting the requirements of ASTM A563 Grade A.
- B. Where anchor rods are used to anchor galvanized steel or are otherwise specified to be galvanized, anchor rods and nuts shall be hot-dip galvanized in accordance with ASTM F1554.
- C. Where pipe sleeves around anchor rods are shown on the Drawings, pipe sleeves shall be cut from Schedule 40 PVC plastic piping meeting the requirements of ASTM D1785.

2.02 HIGH STRENGTH BOLTS

- A. High strength bolts and associated nuts and washers shall be in accordance with ASTM A325 or ASTM A490. Bolts, nuts and washers shall meet the requirements of AISC 348 "The 2009 RCSC Specification for Structural Joints".
- B. Where high strength bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A325.

2.03 STAINLESS STEEL BOLTS

- A. Stainless steel bolts shall conform to ASTM F-593. All underwater fasteners, fasteners in confined areas containing fluid, and fasteners in corrosive environments shall be Type 316 stainless steel unless noted otherwise. Fasteners for aluminum and stainless steel members not subject to the above conditions shall be Type 304 stainless steel unless otherwise noted.
- B. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer and shall be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts shall be of the same alloy as the bolts.

2.04 WELDS

- A. Electrodes for welding structural steel and all ferrous steel shall comply with AWS Code, using E70 series electrodes for shielded metal arc welding (SMAW), or F7 series electrodes for submerged arc welding (SAW).
- B. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.

C. Electrodes for welding stainless steel and other metals shall comply with AWS D1.6.

2.05 WELDED STUD CONNECTORS

A. Welded stud connectors shall conform to the requirements of AWS D1.1 Type C.

2.06 EYEBOLTS

A. Eyebolts shall conform to ASTM A489 unless noted otherwise.

2.07 HASTELLOY FASTENERS

A. Hastelloy fasteners and nuts shall be constructed of Hastelloy C-276.

2.08 ANTISEIZE LUBRICANT

A. Antiseize lubricant shall be C5-A Anti-Seize by Loctite Corporation, Molykote P-37 Anti-Seize Paste by Dow Corning, 3M Anti-Seize by 3M, or equal.

PART 3 – EXECUTION

3.01 MEASUREMENTS

A. The Contractor shall verify all dimensions and review the Drawings and shall report any discrepancies to the Engineer for clarification prior to starting fabrication.

3.02 WELDING

A. All welding shall comply with AWS Code for procedures, appearance, quality of welds, qualifications of welders and methods used in correcting welded work.

B. Welded stud connectors shall be installed in accordance with AWS D1.1.

3.03 INSPECTION

A. High strength bolting will be visually inspected in accordance with AISC 348 "The 2009 RCSC Specification for Structural Joints". Rejected bolts shall be either replaced or retightened as required.

B. Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.

C. Post-installed concrete anchors shall be inspected as required by ACI 318.

3.04 CUTTING OF EMBEDDED REBAR

A. The Contractor shall not cut embedded rebar cast into structural concrete during installation of post-installed fasteners without prior approval of the Engineer.

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SECTION 05 14 00

STRUCTURAL ALUMINUM

PART 1 – GENERAL

1.01 THE REQUIREMENT

- A. Furnish all equipment, labor, materials, and services required to provide all structural aluminum work in accordance with the Contract Documents. The term "structural aluminum" shall include items as defined in the Aluminum Association "Specifications for Aluminum Structures".

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05 01 00 - Metal Materials
- B. Section 05 05 23 - Metal Fastening
- C. Section 09 91 00 - Painting

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of the Bid.
 - 1. International Building Code
 - 2. Aluminum Association "Specifications for Aluminum Structures"
 - 3. AWS D1.2 - "Structural Welding Code".

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00, Submittals.
 - 1. Certified Mill Test Reports
 - 2. Affidavit of Compliance with grade specified
 - 3. Shop Drawings which include the following:
 - a. Layout drawings indicating all structural shapes, sizes, and dimensions.
 - b. Beam and column schedules.
 - c. Detailed drawings indicating jointing, anchoring and connection details.

1.05 QUALITY ASSURANCE

- A. Shop inspection may be required by the Owner at his own expense. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the work. Inspectors shall have the authority to reject any materials or work which do not meet the requirements of these Specifications. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Specification.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Structural aluminum shall comply with Section 05 01 00, Metal Materials.
- B. Fasteners for structural aluminum shall be in accordance with Section 05 05 23, Metal Fastening.
- C. Electrodes for welding shall be in accordance with Section 05 05 23, Metal Fastening.

PART 3 – EXECUTION

3.01 MEASUREMENT

- A. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of work. The Contractor shall review the Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 FABRICATION

- A. Fabrication shall be in accordance with the Aluminum Association "Specifications for Aluminum Structures." Fabrication shall begin only after Shop Drawing approval.
- B. Except where otherwise noted on the Drawings or in this Specification, all shop connections shall be welded.
- C. All holes in structural aluminum members required for anchors, anchor rods, bolts, or other members or for attachment of other work shall be provided by the fabricator and detailed on the Shop Drawings.
- D. All materials shall be properly worked and match-marked for field assembly.

3.03 DELIVERY, STORAGE AND HANDLING

- A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.

- B. Structural aluminum members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. The Contractor shall repair or replace damaged materials or structures as directed.

3.04 ERECTION

- A. All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor.
- B. Structural members shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before being permanently fastened.
- C. No cutting of structural aluminum members in the field will be allowed except by the written approval of the Engineer.
- D. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly.
- E. Field welding shall not be permitted unless specifically indicated in the Drawings or approved in writing by the Engineer. All field welding shall comply with Section 05 05 23, Metal Fastening.
- F. All bolted connections shall comply with Section 05 05 23, Metal Fastening.
- G. All field connections shall be accurately fitted up before being bolted. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.
- H. Misfits at Bolted Connections
 1. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.
 2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.
 3. Where misalignment between anchor bolts and bolt holes in aluminum members are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.

I. Grouting of Base Plates and Bearing Plates

1. The bottom surface of the plates shall be cleaned of all foreign materials, and concrete or masonry bearing surface shall be cleaned of all foreign materials and roughened to improve bonding.
2. Accurately set all base and bearing plates to designated levels with steel wedges or leveling plates.
3. Baseplates shall be grouted with non-shrink grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure. Non-shrink grout shall conform to Section 03 60 00, Grouting.
4. Anchor bolts shall be tightened after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.

J. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.

3.05 PAINTING

- A. Painting shall be performed according to Section 09 91 00, Painting.
- B. Aluminum surfaces in contact with concrete or dissimilar metals shall be thoroughly protected with two coats of epoxy paint with a minimum total thickness of 16 mils or other approved isolating material in accordance with the requirements of Section 09 91 00 - Painting.

- END OF SECTION -

SECTION 05 51 00

METAL STAIRS

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish all materials, labor, and equipment required to provide all metal stairs in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05 01 00 - Metal Materials
- B. Section 05 05 23 - Metal Fastenings
- C. Section 05 52 00 – Metal Railings

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. International Building Code
 - 2. AISC Specification for Structural Steel Buildings
 - 3. AISI Specification for the Design of Cold-Formed Steel Structural Members
 - 4. Aluminum Association Specifications for Aluminum Structures

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00 - Submittals.
 - 1. Complete fabrication and erection drawings of all metal work specified herein.
 - 2. Other submittals as required in accordance with Section 05 01 00 - Metal Materials, and Section 05 05 23 - Metal Fastening.

PART 2 – PRODUCTS

2.01 METAL MATERIALS

- A. Metal materials used for metal stairs shall conform to Section 05 01 00, Metal Materials, unless noted otherwise.

2.02 METAL FASTENING

- A. All welds and fasteners used in metal stairs shall conform to Section 05 05 23, Metal Fastening, unless noted otherwise.

2.03 METAL STAIRS AND LANDINGS

- A. Stair stringers and structural framing of landings shall be fabricated from steel or aluminum as indicated on the Drawings.
 - 1. Steel stairs shall be fabricated from aluminum.
 - 2. Aluminum stairs shall be fabricated from aluminum alloy 6061-T6.
- B. Regardless of material of stringers, all stair treads shall be aluminum.
- C. Handrails for metal stairs shall conform to Section 05 52 00, Metal Railings. Contractor shall coordinate attachment of handrails to metal stairs.
- D. All clips, anchors, and necessary appurtenances shall be provided for a complete and rigid installation.
- E. Closure plates shall be provided for all exposed ends of stringers.
- F. All exposed connections shall be welded and ground smooth, unless otherwise indicated on the Drawings.
- G. Stairs and landings shall be designed to support a 100 psf live load, minimum, unless otherwise indicated on the Drawings.

2.04 STEEL PAN STAIRS

- A. General
 - 1. All steel stairs and landings with concrete filled steel pan risers and treads shall meet all applicable OSHA, ANSI, and NFPA codes.
 - 2. Stair assemblies shall conform to the dimensions and arrangements shown on the Drawings.
 - 3. Stair assemblies shall be designed to support a minimum 100 psf live load unless otherwise indicated on the Drawings.
 - 4. Steel framing, hangers, columns, struts, clips, brackets, bearing plates, and other necessary appurtenances shall be provided for support of stairs and platforms as shown on the Drawings.

5. Exposed portions of steel pans, platforms, framing system stringers, and portions of aluminum nosings in contact with concrete, steel, or masonry shall be painted in accordance with Section 09 91 00, Painting.
6. Concrete fill shall be 3-inches thick for platforms and 1-1/2 inches thick for pan treads.
7. Cast-in-place safety stair nosings in accordance with Section 05 55 00, Metal Stair Treads and Nosings, shall be provided for treads and platforms.
8. Metal pan treads, platforms, and risers shall be fabricated from 0.1084-inch thick (12 gauge minimum), galvanized structural steel sheets.
9. Risers and treads shall be supported by steel angle brackets welded to the stringers. Metal pans shall be secured to the brackets with welds.
10. Closure pieces shall be provided for ends of stringers.

B. Connections

1. All connections shall be welded unless otherwise shown on the Drawings or specified herein. All welds shall be continuous and ground smooth where exposed. Welding shall conform to Section 05 05 23, Metal Fastening.
2. Assemblies shall be fabricated such that bolts and other fastenings do not appear on finished surfaces.
3. All joints shall be true and tight, and connections between parts shall be light-proof tight.

- C. Handrails for steel pan stairs shall conform to Section 05 52 00, Metal Railings. Contractor shall coordinate connection of handrails to stairs.

2.05 ALTERNATING TREAD STAIRS

- A. Stairs, landings, and platforms shall be designed to carry a live load of 100 lbs. per square foot, unless noted otherwise on the Drawings.
- B. The stairs shall be welded, alternating tread type stairs having a center spine and a cast integrally welded combination mounting plate and top landing, flush with the upper floor level. Handrails shall be custom formed and contoured to provide close body support and shall be welded on to the balusters which extend directly from the treads. All risers shall be equal, including the first and last risers, and treads shall have anti-skid surfaces. The stringer bottoms shall be bent and/or cut and welded to a floor plate. All exposed connections shall be welded and ground smooth.
- C. Treads, floor plate castings, and landing shall be aluminum alloy AAF356F. Half treads shall be at least 9-inches wide and 10-inches deep. The central stringer shall be aluminum alloy 6063-T52, 1-3/4-inches x 4 inches x 1/8-inch box shape. Handrails shall be aluminum alloy 6061-T4. Finish shall be Aluminum Association M12C22A41.

- D. The alternating tread type stairs shall be Model 68AL, as manufactured by Lapeyre Stair, Harahan, Louisiana.

PART 3 – EXECUTION

3.01 FABRICATION

- A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with all adjoining work.
- B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, fillets, connections, brackets, and other details necessary for a complete installation shall be provided.
- C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.
- D. Finished members shall conform to the lines, angles, and curves shown on the drawings and shall be free from distortions of any kind.
- E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.
- F. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05 05 23, Metal Fastening. All fastenings shall be concealed where practicable.
- G. Fabricated items shall be shop painted when specified in accordance with Section 09 91 00, Painting.

3.02 INSTALLATION

- A. Assembly and installation of metal stairs shall be performed in strict accordance with manufacturer's recommendations.
- B. All miscellaneous metalwork shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.
- C. Metal stairs shall field painted when specified in accordance with Section 09 91 00, Painting.

- END OF SECTION -

SECTION 05 52 00

METAL RAILINGS

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish all materials, labor, and equipment required to provide all handrails and railings in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05 01 00 - Metal Materials
- B. Section 05 05 23 - Metal Fastening

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. International Building Code
 - 2. Aluminum Association Specifications for Aluminum Structures
 - 3. Occupational Safety and Health Administration (OSHA) Regulations

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00, Submittals.
 - 1. Complete fabrication and erection drawings of all metal work specified herein.
 - 2. Other submittals as required in accordance with Section 05 01 00, Metal Materials and Section 05 05 23, Metal Fastening.

PART 2 – PRODUCTS

2.01 METAL MATERIALS

- A. Metal materials used for handrails and railings shall conform to Section 05 01 00, Metal Materials, unless noted otherwise.

2.02 METAL FASTENING

- A. All welds and fasteners used in handrails and railings shall conform to Section 05 05 23, Metal Fastening, unless noted otherwise.

2.03 HANDRAILS AND RAILINGS

- A. General - Handrail systems shall consist of all railings, posts, toeboards, baseplates, anchors, and accessories required for a complete and rigid installation.
 1. All handrail systems shall be fabricated from extruded aluminum alloy 6061-T6 or 6105-T5, with Aluminum Association M12C22A41 finish, unless otherwise noted.
 2. Metal railings shall be fabricated from 1-1/2-inch Schedule 40 pipe. Metal railing support posts shall be fabricated from 1-1/2-inch Schedule 80 pipe.
 3. The centerline of the top guard rail shall be 42 inches above the walking surface for level rail. For stair rail, the centerline of the top guard rail shall be 42 inches above the leading edge of the tread nosing. Stair handrail shall be 34 inches above the leading edge of the tread nosing.
 4. Posts
 - a. Maximum horizontal spacing between posts for level rail shall be six feet.
 - b. Maximum horizontal spacing between posts for stair rail shall be five feet.
 5. All rail joints shall be finished flush and shall occur only at supports. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations. The top surface of the top railing shall be smooth and shall not be interrupted by projecting fittings.
 6. Toeboards
 - a. Toeboards shall project 4-inches above the walking surface and shall not infringe on the minimum required walkway width.
 - b. Aluminum toeboards shall be extruded from aluminum alloy 6063-T6 unless otherwise noted.
 - c. Toeboards shall have a minimum thickness of 1/8" at any point. Geometry of toeboard shall closely resemble geometry shown on Drawings.
 7. Expansion joint splices shall be provided at 30-foot maximum spacing and at all expansion joints in the structure supporting the handrail.
 8. The handrail system shall be designed to resist the design loads specified by both OSHA and the International Building Code.
 9. Provide handrail extensions at top and bottom of stairs and ramps in accordance with the International Building Code.

- B. For metal handrail, the Contractor shall have the option of providing a handrail system of either an all welded type construction or a component type construction.
 1. With both the all welded or component type construction, the baseplates and toeboards shall be furnished as shown on the Drawings.
 2. Component Type System
 - a. All fittings and brackets shall be designed for stainless steel concealed set screws with internal tyne type connectors.
 - b. Exposed fittings shall be cast or extruded aluminum, or stainless steel to match ladder material, except where corrosion-resistant steel is employed as a standard fabricator's item for use.
 - c. Component type handrail shall be as manufactured by Thompson Fabricating Company, Inc., or Hollaender Manufacturing Company, Inc.
 3. Welded handrail may be field assembled using component type fittings as described herein.
- C. Handrail shall be either Type I or Type II handrail as shown on the Drawings. If no type is indicated on Drawings, handrail shall be Type I.
 1. Type I handrail shall be a two-rail system. The centerline of the intermediate rail shall be 21 inches above the walking surface.
 2. Type II handrail shall be a three-rail system with vertical posts spanning between the two intermediate rails.
 - a. The centerline of the lower intermediate rail shall be 7 inches above the walking surface.
 - b. The centerline of the upper intermediate rail shall be 5-3/4" below the centerline of the top rail.
 - c. Vertical posts spanning between the intermediate rails shall be 1/2" diameter schedule 40 pipe or fiberglass rod.
 - d. Spacing of vertical posts shall be as required to prevent passage of a 4-inch sphere at any point.
- D. Where gates are required in handrails as shown on the Drawings, they shall be self-closing and shall be provided by the same manufacturer as the handrail. Gates shall swing away from the opening being protected by the handrail.
- E. Where safety chains are required in handrails as shown on the Drawings, chains shall be constructed of Type 304 stainless steel. Chains shall be straight link style, 3/16-inch diameter, with at least twelve links per foot, and with snap hooks on each end. Snap hooks shall be boat type and eye bolts for attachment of chains shall be 3/8-inch bolts with 3/4-

inch eye diameter welded to the railing posts. Two (2) chains, four inches longer than the anchorage spacing shall be supplied for each guarded area.

2.04 FREE STANDING RAILING SYSTEM

- A. Free standing railing system shall be installed on roof ledges where accessible equipment is provided on roof and roof does not have a perimeter parapet wall of a minimum height of 42 inches. Free standing railing system shall be Safety Rail 2000 Guardrail System by BlueWater Mfg., Inc. or approved equal.
- B. Toe Board brackets shall be used when the parapet wall is less than 3-1/2" in height.
- C. Performance Characteristics: Shall meet and exceed OSHA (Standards - 29 CFR) 1926.502 (b).
 - 1. Railing System shall be designed to withstand a minimum 200 pounds of test load in any direction.
 - 2. Railing System shall consist of a top rail and rail at mid height between top rail and walking surface.
 - 3. Railing system shall extend to a height of at least 42" from the finished roof deck.
 - 4. Railing system shall be free of sharp edges and snag points.
- D. Railing and Base
 - 1. Rail shall be 1 5/8" O.D. Hot Rolled Pickled Electric Weld Tubing.
 - 2. Each support post shall have a free-standing base cast from Class 30 Gray Iron material.
 - 3. Each base shall have four (4) receiver posts for accepting the rails.
 - 4. The receiver posts shall have a positive locking system. A friction locking system will not be acceptable.
 - 5. The receiver posts shall have a slot to enable the rails to be mounted in any direction.
- E. Hardware
 - 1. The securing pins shall be made from 1010 carbon steel. The pins shall be zinc plated and yellow chromate dipped. The pins shall consist of a collared pin and a lanyard that connects to a lynch pin.
 - 2. For Gate Assemblies Only. Bolts and washers shall be 3/8" x 3 1/2" and 3/8" x 3" grade 5, zinc plated.

3. Finish:

Rails: Specify factory finish Safety Yellow Powder Coat Paint, Hot Dipped Galvanized or a color to match the building.

Bases: Specify factory finish Safety Yellow Powder Coat Paint, Hot Dipped Galvanized or a color to match the building.

PART 3 – EXECUTION

3.01 FABRICATION

- A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with all adjoining work.
- B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection.
- C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.
- D. Finished members shall conform to the lines, angles, and curves shown on the drawings and shall be free from distortions of any kind.
- E. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.
- F. Concrete anchors and bolts for attachment of handrail baseplates to supporting members shall conform to Section 05 05 23, Metal Fastening.
- G. All fabricated items shall be shop painted in accordance with Section 09 91 00, Painting.

3.02 INSTALLATION

- A. Assembly and installation of handrails and railings shall be performed in strict accordance with manufacturer's recommendations.
- B. All handrails and railings shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

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SECTION 05 55 00

METAL TREADS AND NOSINGS

PART 1 – GENERAL

1.01 REQUIREMENT

- A. Furnish all materials, labor, and equipment required to provide all stair treads and nosings in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05 01 00 - Metal Materials
- B. Section 05 05 23 - Metal Fastenings
- C. Section 05 51 00 - Metal Stairs

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. International Building Code
 - 2. Aluminum Association Specifications for Aluminum Structures.

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00, Submittals.
 - 1. Complete fabrication and erection drawings of all work specified herein.
 - 2. Other submittals as required in accordance with Section 05 01 00, Metal Materials, and Section 05 05 23, Metal Fastenings.

PART 2 – PRODUCTS

2.01 METAL MATERIALS

- A. Metal materials used for stair treads and nosings shall conform to Section 05 01 00, Metal Materials, unless noted otherwise.

2.02 METAL FASTENING

- A. All welds and fasteners used for stair treads and nosings shall conform to Section 05 05 23, Metal Fastening, unless noted otherwise.

2.03 SAFETY STAIR NOSINGS

- A. Abrasive cast aluminum, safety stair nosings shall be provided on all concrete or concrete filled steel pan stairs, including the top stair of metal stairs that attach to concrete, and as shown on the Drawings unless noted otherwise.
- B. Nosing shall be 3 inches wide and shall extend the full width of the stairway minus 3 inches on either side. Nosing shall be cast into the concrete and held in place with butterfly type extruded anchors.
- C. The nosing shall be "Style 231-A", by Amstep Products, "Alumogrit Type 101", by Wooster Products, Inc., "Type AX", by Safe-T-Metal Company. For steel pan concrete filled stairs, nosing shall be "Type 101-SP", Wooster Products, Inc., or "Type AXPE", by Safe-T-Metal Company. For pan stairs, nosing shall be continuous over corner of stair treads to fully protect corner of treads from abrasion. All exposed fasteners shall be Type 304 stainless steel.

2.04 STAIR TREADS

- A. Stair treads shall be aluminum with an abrasive nosing as shown on the Drawings.
- B. Stair treads shall be designed for the live load specified in Section 05 51 00, Metal Stairs.
- C. Stair treads shall be as manufactured by IKG Industries, or Safe-T-Metal Company.

PART 3 – EXECUTION

3.01 FABRICATION

- A. All measurements and dimensions shall be based on field conditions and shall be verified by the Contractor prior to fabrication. Such verification shall include coordination with adjoining work.
- B. All fabricated work shall be shop fitted together as much as practicable, and delivered to the field, complete and ready for erection. All miscellaneous items such as stiffeners, connections, brackets, and other details necessary for a complete installation shall be provided.
- C. All work shall be fabricated and installed in a manner that will provide for expansion and contraction, prevent shearing of bolts, screws, and other fastenings, ensure rigidity, and provide a close fit of sections.
- D. All shearings shall be neat and accurate, with parts exposed to view neatly finished. Flame cutting is allowed only when performed utilizing a machine.

- E. All shop connections shall be welded unless otherwise indicated on the Drawings or specified herein. Bolts and welds shall conform to Section 05 05 23, Metal Fastenings. All fastenings shall be concealed where practicable.

3.02 INSTALLATION

- A. Assembly and installation of stair treads and nosings shall be performed in strict accordance with manufacturer's recommendations.
- B. All stair treads and nosings shall be erected square, plumb and true, accurately fitted, adequately anchored in place, and set at proper elevations and positions.

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SECTION 09 91 00

PAINTING

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish labor, materials, equipment and appliances required for complete execution of Work shown on Drawings and Specified herein.
- B. Section Includes:
 - 1. Paint Materials
 - 2. Shop Painting
 - 3. Field Painting
 - a. Surface Preparation
 - b. Piping and Equipment Identification
 - c. Schedule of Colors
 - d. Work in Confined Spaces
 - e. OSHA Safety Colors

1.02 RELATED SECTIONS

- A. N/A

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of these specifications, the Work shall conform to the applicable requirements of the following documents:
 - 1. SSPC – The Society for Protective Coatings Standards
 - a. SSPC-Vis 1 Pictorial Surface Preparation Standards for Painting Steel Structures
 - b. SSPC-SP2 Hand Tool Cleaning
 - c. SSPC-SP3 Power Tool Cleaning
 - d. SSPC-SP5 White Metal Blast Cleaning

- e. SSPC-SP6 Commercial Blast Cleaning
 - f. SSPC-SP10 Near-White Metal Blast
 - g. SSPC-SP13/NACE6 Surface Preparation of Concrete
2. NACE - National Association of Corrosion Engineers
 3. ASTM D1737 - Test Method for Elongation of Attached Organic Coatings with Cylindrical Mandrel Apparatus
 4. ASTM B117 - Method of Salt Spray (Fog) Testing
 5. ASTM D4060 - Test Method for Abrasion Resistance of Organic Coating by the Taber Abraser
 6. ASTM D3359 - Method for Measuring Adhesion by Tape Test

1.04 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in Section 01 33 00 - Submittals, submit the following:
 1. Manufacturer's literature and Material Safety Data Sheets for each product.
 2. Painting schedule identifying surface preparation and paint systems proposed. Cross-reference with Tables 9-1 and 9-2. Provide the name of the paint manufacturer, and name, address, and telephone number of manufacturer's representative who will inspect the work. Submit schedule for approval as soon as possible following the Award of Contract, so approved schedule may be used to identify colors and specify shop paint systems for fabricated items.

1.05 SYSTEM DESCRIPTION

- A. Work shall include surface preparation, paint application, inspection of painted surfaces and corrective action required, protection of adjacent surfaces, cleanup and appurtenant work required for the proper painting of all surfaces to be painted. Surfaces to be painted are designated within the Painting Schedule and may include new and existing piping, miscellaneous metals, equipment, buildings, exterior fiberglass, exposed electrical conduit and appurtenance.
- B. Perform Work in strict accordance with manufacturer's published recommendations and instructions, unless the Engineer stipulates that deviations will be for the benefit of the project.
- C. Paint surfaces which are customarily painted, whether indicated to be painted or not, with painting system applied to similar surfaces, areas and environments, and as approved by Engineer.
- D. Piping and equipment shall receive color coding and identification. Equipment shall be the same color as the piping system.

1.06 QUALITY ASSURANCE

- A. Painting operations shall be accomplished by skilled craftsmen and licensed by the state to perform painting work.
- B. Provide a letter indicating that the painting applicator has five years of experience, and five references which show previously successful application of the specified or comparable painting systems. Include the name, address, and the telephone number for the Owner of each installation for which the painting applicator provided services.

1.07 STORAGE AND DELIVERY

- A. Bring materials to the job site in the original sealed and labeled containers.
- B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

PART 2 – MATERIALS

2.01 GENERAL INFORMATION

- A. The term "paint" is defined as both paints and coatings including emulsions, enamels, stains, varnishes, sealers, and other coatings whether organic or inorganic and whether used as prime, intermediate, or finish coats.
- B. Purchase paint from an approved manufacturer. Manufacturer shall assign a representative to inspect application of their product both in the shop and field. The manufacturer's representative shall submit a report to the Engineer at the completion the Work identifying products used and verifying that surfaces were properly prepared, products were properly applied, and the paint systems were proper for the exposure and service.
- C. Provide primers and intermediate coats produced by same manufacturer as finish coat. Use only thinners approved by paint manufacturer, and only within manufacturer's recommended limits.
- D. Ensure compatibility of total paint system for each substrate. Test shop primed equipment delivered to the site for compatibility with final paint system. Provide an acceptable barrier coat or totally remove shop applied paint system when incompatible with system specified and repaint with specified paint system.
- E. Use painting materials suitable for the intended use and recommended by paint manufacturer for the intended use.

- F. Require that personnel perform work in strict accordance with the latest requirements of OSHA Safety and Health Standards for construction. Meet or exceed requirements of regulatory agencies having jurisdiction and the manufacturer's published instructions and recommendations. Maintain a copy of all Material Safety Data Sheets at the job site of each product being used prior to commencement of work. Provide and require that personnel use protective and safety equipment in or about the project site. Provide respiratory devices, eye and face protection, ventilation, ear protection, illumination and other safety devices required to provide a safe work environment.

2.02 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Specifications, provide products from one of the following manufacturers:
 - 1. Tnemec Company Inc.
 - 2. PPG/Ameron
 - 3. Carboline
 - 4. Sherwin-Williams
 - 5. Induron

PART 3 – EXECUTION

3.01 SHOP PAINTING

- A. Shop prime fabricated steel and equipment with at least one shop coat of prime paint compatible with finish paint system specified. Prepare surface to be shop painted in strict accordance with paint manufacturer's recommendations and as specified. Finish coats may be shop applied, if approved by the Engineer. Package, store and protect shop painted items until they are incorporated into Work. Repair painted surfaces damaged during handling, transporting, storage, or installation to provide a painting system equal to the original painting received at the shop.
- B. Identify surface preparation and shop paints on Shop Drawings. Verify compatibility with field applied paints.

3.02 SURFACE PREPARATION

- A. General
 - 1. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale, and foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless approved by the Engineer.
 - 2. Protect or remove, during painting operations, hardware, accessories, machined surfaces, nameplates, lighting fixtures, and similar items not intended to be painted prior to cleaning and painting. Reposition items removed upon completion of painting operations.

3. Examine surfaces to be coated to determine that surfaces are suitable for specified surface preparation and painting. Report to Engineer surfaces found to be unsuitable in writing. Do not start surface preparation until unsuitable surfaces have been corrected. Starting surface preparation precludes subsequent claim that such surfaces were unsuitable for the specified surface preparation or painting.
4. Surface preparation shall be in accordance with specifications and manufacturer's recommendations. Provide additional surface preparation, and fill coats where manufacturer recommends additional surface preparation, in addition to requirements of specification.
5. Touch-up shop or field applied coatings damaged by surface preparation or any other activity, with the same shop or field applied coating; even to the extent of applying an entire coat when required to correct damage prior to application of the next coating. Touch-up coats are in addition to the specified applied systems, and not considered a field coat.
6. Protect motors and other equipment during blasting operation to ensure blasting material is not blown into motors or other equipment. Inspect motors and other equipment after blasting operations and certify that no damage occurred, or where damage occurred, the proper remedial action was taken.
7. Field paint shop painted equipment in compliance with Color Coding and as approved by Engineer.

B. Metal Surface Preparation

1. Conform to current The Society for Protective Coatings Standards (SSPC) Specifications for metal surface preparation. Use SSPC-Vis-1 pictorial standards or NACE visual standards TM-01-70 or TM-01-75 to determine cleanliness of abrasive blast cleaned steel.
2. Perform blast cleaning operations for metal when following conditions exist:
 - a. Moisture is not present on the surface.
 - b. Relative humidity is below 80%.
 - c. Ambient and surface temperatures are 5°F or greater than the dew point temperature.
 - d. Painting or drying of paint is not being performed in the area.
 - e. Equipment is in good operating condition.
 - f. Proper ventilation, illumination, and other safety procedures and equipment are being provided and followed.
3. Sandblast ferrous metals to be shop primed, or component mechanical equipment in accordance with SSPC-SP5, White Metal Blast.

4. Sandblast field prepared ferrous metals in accordance with SSPC-SP10, Near White Metal Blast, where metal is to be submerged, in a corrosive environment, or in severe service.
5. Sandblast field prepared ferrous metals in accordance with SSPC-SP6 Commercial Blast, where metal is to be used in mild or moderate service, or non-corrosive environment.
6. Clean nonferrous metals, copper, or galvanized metal surfaces in accordance to SSPC-SP1, Solvent Cleaning, or give one coat of metal passivator or metal conditioner compatible with the complete paint system.
7. Prime cleaned metals immediately after cleaning to prevent rusting.
8. Clean rusted metals down to bright metal by sandblasting and immediately field primed.

C. Concrete Surface Preparation

1. Cure concrete a minimum of 30 days before surface preparation, and painting begins.
2. Test concrete for moisture content using test method recommended by the paint manufacturer. Do not begin surface preparation, or painting until moisture content is acceptable to manufacturer.
3. Prepare concrete surfaces to receive coatings in accordance with SSPC-13 – Concrete Surface Preparation. Remove contaminants, open bugholes, surface voids, air pockets, and other subsurface irregularities. Do not expose underlying aggregate. Use dry, oil-free air for blasting operations. Surface texture after blasting shall be similar to that of medium grit sandpaper. Remove residual abrasives, dust, and loose particles by vacuuming or blowing with high pressure air.
4. Acid etch (Reference ASTM D 260) concrete floors to receive paint. Following method is a minimum requirement. Remove residual dust and dirt. Wet surface of concrete until surface is damp. Etch surface with 15% to 20% muriatic acid solution to produce a "medium sandpaper" texture. Do not allow acid solution to dry on concrete. Rinse concrete when bubbling action of the acid begins to subside. Continue rinsing process until pH is 7 or higher. Remove excess water and allow concrete to thoroughly dry before coating. Other methods may be used, if approved by Engineer.
5. Surface defects, such as hollow areas, bugholes, honeycombs, and voids shall be filled with polymeric filler compatible with painting system. Complete fill coats may be used in addition to specified painting system and as approved by the Engineer. Fins, form marks, and all protrusions or rough edges shall be removed.
6. Repair existing concrete surfaces which are deteriorated to the point that surface preparation exposes aggregate with fill coats or patching mortar as recommended by paint manufacturer and as directed by the Engineer.

7. Clean concrete of all dust, form oils, curing compounds, oil, tar, laitance, efflorescence, loose mortar, and other foreign materials before paints are applied.

D. Wood

1. Clean wood surfaces free of all foreign matter, with cracks and nail holes and other defects properly filled and smoothed. Remove sap and resin by scraping and wipe clean with rags dampened with mineral spirits.
2. Saturate end grain, cut wood, knots, and pitch pockets with an appropriate sealer before priming.
3. Prime and backprime wood trim before setting in place.
4. After prime coat has dried, fill nailholes, cracks, open joints, and other small holes with approved spackling putty. Lightly sand wood trim prior to applying second coat of paint.

E. Castings

1. Prepare castings for painting by applying a brush or a knife-applied filler. Fillers are not to be used to conceal cracks, pinholes, or excessive porosity.
2. Apply one coat of primer with a minimum thickness of 1.2 mils in addition to coats specified. Allow sufficient drying time before further handling.

F. Masonry

1. Cure for a minimum of 30 days prior to paint application.
2. Clean masonry surfaces free from all dust, dirt, oil, grease, loose mortar, chalky deposits, efflorescence, and other foreign materials.
3. Test masonry for moisture content. Use test method recommended by paint manufacturer. Do not begin painting until moisture content is acceptable to manufacturer.

G. Gypsum Drywall

1. Sand joint compound with sandpaper to provide a smooth flat surface. Avoid sanding of adjacent drywall paper.
2. Remove dust, dirt, and other contaminants.

H. Previously-Painted Surfaces

1. Totally remove existing paint when: surface is to be submerged in a severe environment, paint is less than 75% intact, brittle, eroded or has underfilm rusting.

2. Surfaces which are greater than 75% intact require removal of failed paints and then spot primed. Spot priming is in addition to coats specified.
3. Remove surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers.
4. Clean and dull glossy surfaces prior to painting in accordance with the manufacturer's recommendations.
5. Check existing paints for compatibility with new paint system. If incompatible, totally remove existing paint system or apply a barrier coat recommended by the paint manufacturer. Remove existing paints of undetermined origin. Prepare a test patch of approximately 3 square feet over existing paint. Allow test patch to dry thoroughly and test for adhesion. If proper adhesion is not achieved remove existing paint and repaint.

3.03 APPLICATION OF PAINT

- A. Apply paint by experienced painters with brushes or other applicators approved by the Engineer, and paint manufacturer.
- B. Apply paint without runs, sags, thin spots, or unacceptable marks.
- C. Apply at rate specified by the manufacturer to achieve at least the minimum dry mil thickness specified. Apply additional coats, if necessary, to obtain thickness.
- D. Special attention shall be given to nuts, bolts, edges, angles, flanges, etc., where insufficient film thicknesses are likely. Stripe paint prior to applying prime coat. Stripe painting shall be in addition to coats specified.
- E. Perform thinning in strict accordance with the manufacturer's instructions, and with the full knowledge and approval of the Engineer and paint manufacturer.
- F. Allow paint to dry a minimum of twenty-four hours between application of any two coats of paint on a particular surface, unless shorter time periods are a requirement by the manufacturer. Longer drying times may be required for abnormal conditions as defined by the Engineer and paint manufacturer. Do not exceed manufacturer's recommended drying time between coats.
- G. Suspend painting when any of the following conditions exist:
 1. Rainy or excessively damp weather.
 2. Relative humidity exceeds 85%.
 3. General air temperature cannot be maintained at 50°F or above through the drying period, except on approval by the Engineer and paint manufacturer.
 4. Relative humidity will exceed 85% or air temperature will drop below 40°F within 18 hours after application of paint.

5. Surface temperature of item is within 5 degrees of dewpoint.
6. Dew or moisture condensation are anticipated.
7. Surface temperature exceeds the manufacturer's recommendations.

3.04 INSPECTION

- A. Each field coat of paint will be inspected and approved by the Engineer or his authorized representative before succeeding coat is applied. Tint successive coats so that no two coats for a given surface are exactly the same color. Tick-mark surfaces to receive black paint in white between coats.
- B. Use magnetic dry film thickness gauges and wet film thickness gauges for quality control. Furnish magnetic dry film thickness gauge for use by the Engineer.
- C. Coatings shall pass a holiday detector test.
- D. Determination of Film Thickness: Randomly selected areas, each of at least 107.5 contiguous square feet, totaling at least 5% of the entire control area shall be tested. Within this area, at least 5 squares, each of 7.75 square inches, shall be randomly selected. Three readings shall be taken in each square, from which the mean film thickness shall be calculated. No more than 20 percent of the mean film thickness measurements shall be below the specified thickness. No single measurement shall be below 80 percent of the specified film thickness. Total dry film thickness greater than twice the specified film thickness shall not be acceptable. Areas where the measured dry film thickness exceeds twice that specified shall be completely redone unless otherwise approved by the Engineer. When measured dry film thickness is less than that specified additional coats shall be applied as required.
- E. Holiday Testing: Holiday test painted ferrous metal surfaces which will be submerged in water or other liquids, or surfaces which are enclosed in a vapor space in such structures. Mark areas which contain holidays. Repair or repaint in accordance with paint manufacturer's printed instructions and retest.
 1. Dry Film Thickness Exceeding 20 Mils: For surfaces having a total dry film thickness exceeding 20 mils: Pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.
 2. Dry Film Thickness of 20 Mils or Less: For surfaces having a total dry film thickness of 20 mils or less: Tinker & Rasor Model M1 non-destructive type holiday detector, K-D Bird Dog, shall be used. The unit shall operate at less than 75-volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flow, shall be added to the water prior to wetting the detector sponge.
- F. Paint manufacturer or his representative shall provide their services as required by the Engineer. Services shall include, but not be limited to, inspecting existing paint, determination of best means of surface preparation, inspection of completed work, and final inspection of painted work 11 months after the job is completed.

3.05 PROTECTION OF ADJACENT PAINT AND FINISHED SURFACES

- A. Use covers, masking tape, other method when protection is necessary, or requested by Owner or Engineer. Remove unwanted paint carefully without damage to finished paint or surface. If damage does occur, repair the entire surface adjacent to and including the damaged area without visible lapmarks and without additional cost to the Owner.
- B. Take all necessary precautions to contain dispersion of sandblasting debris and paint to the limits of the work. Take into account the effect of wind and other factors which may cause dispersion of the sandblasting debris and paint. Suspend painting operations when sanding debris or paint cannot be properly confined. Assume all responsibilities and cost associated with damage to adjacent structures, vehicles, or surfaces caused by the surface preparation and painting operations.

3.06 SCHEDULE OF COLORS

- A. Match colors indicated. Colors which are not indicated shall be selected from the manufacturer's full range of colors by the Engineer. No variation shall be made in colors without the Engineer's approval. Color names and numbers shall be identified according to the appropriate color chart issued by the manufacturer of the particular product in question.

3.07 WORK IN CONFINED SPACES

- A. Provide and maintain safe working conditions for all employees. Supply fresh air continuously to confined spaces through the combined use of existing openings, forced-draft fans and temporary ducts to the outside, or direct air supply to individual workers. Exhaust paint fumes to the outside from the lowest level in the contained space. Provide explosion-proof electrical fans, if in contact with fumes. No smoking or open fires will be permitted in, or near, confined spaces where painting is being done. Follow OSHA, state and local regulations at all times.

3.08 OSHA SAFETY COLORS

- A. Paint wall around wall-mounted breathing or fire apparatus with the appropriate safety red color; area not exceed 2-feet wide by 3-feet high, unless apparatus covers the area. Fire apparatus include fire hoses, extinguisher, and hydrants.
- B. Paint hazardous areas and objects in accordance with OSHA regulations.

**TABLE 9-1
PAINTING SCHEDULE**

SURFACE	APPLICATION	PAINTING SYSTEM & NO. OF COATS	PRODUCT REFERENCE (TABLE 9.2)	TOTAL MIN. DRY FILM THICKNESS (MILS)
<u>Concrete</u> Concrete walls and roof	Exterior of new structures above finished grade (starting 2-feet below grade)	2 coats modified waterborne acrylate	109	6-8/coat
<u>Metals</u> Interior and exterior nonsubmerged (gloss)	All new mechanical equipment, piping, etc.	1 coat epoxy polyamide primer 1 coat epoxy polyamide 1 coat aliphatic polyurethane	104 102 108	4-6 4-6 3-5
Interior insulated		1 coat acrylic latex	103	4
Submerged water	All metal piping, and mechanical equipment, etc.	2 coats NSF 61 approved epoxy polyamide	105	4-6/coat
Steel doors, windows and door frames, steel stairs, monorails, structural steel, misc. metals (steel)		1 coat epoxy polyamide 1 coat aliphatic polyurethane	102 108	5-8 3-4
Aluminum surfaces in contact w/ concrete		2 coats coal tar	107	26

TABLE 9-2
PRODUCT LISTING

REF.	SYSTEM	PURPOSE	PRODUCT				
			<u>Tnemec Series</u>	<u>PPG/ AMERON</u>	<u>CARBOLINE</u>	<u>Sherwin-Williams</u>	<u>Induron</u>
101	Acrylic filler	Primer-sealer	130-6601	BLOXFIL 4000	Sanitile 100	Cement-Plex 875	AC 220 ACRYLIC BLOCK FILLER
102	Epoxy polyamide	Finish coat semi-gloss or gloss	66	AMERLOCK 2/400	Carboguard 890	Macropoxy 646	PERMA-CLEAN II
103	Acrylic latex	Sealer	6	PITT TECH PLUS	Carbocrylic 3359DTM	DTM Acrylic Primer/Finish	AQUANAUT II ACRYLIC ENAMEL
104	Epoxy Polyamide – metal	Primer	66	AMERCOAT 385	Carboguard 893SG	Macropoxy 646	PERMA-CLEAN II EPOXY PRIMER
105	Epoxy	Primer/Finish	20	AMERLOCK 2	Carboguard 561/56LT	Macropoxy 646 PW	PERMA-CLEAN II HIGH-GLOSS
106	Coal tar epoxy	Finish high-coat build	46H-413	AMERCOAT 78HB	Bitumastic 300M	Hi-Mil Sher Tar Epoxy	RUFF STUFF 2100 CT EPOXY
107	Coal tar	Sealer	46-465	AMERCOAT 78HB	Bitumastic 300M	Hi-Mil Sher Tar Epoxy	RUFF STUFF 2100 CT EPOXY
108	Aliphatic Polyurethane	Finish coat	1074 or 1075	AMERCOAT 450 HS	Carbothane 134HG	Acrolon 218HS	INDURETHANE 6600 PLUS
109	Modified Waterborne Acrylate	Finish coat (self-priming)	156	Perma-Crete Pitt-Flex 4-110XI	Flexide	Conflex Smooth A5-451	AC 403 ACRYLIC ELASTOMERIC

- END OF SECTION -

SECTION 26 00 00

GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE

- A. This Section includes general, administrative and procedural requirements for electrical installations. The following general, administrative and procedural requirements are included in this Section to expand the requirements specified elsewhere in general project specifications and in Division 1:
 - 1. Scope of Work.
 - 2. Applicable standards/Quality assurance.
 - 3. Interpretation of Contract Drawings.
 - 4. Priority of Contract Documents.
 - 5. Submittals.
 - 6. Co-ordination drawings.
 - 7. Record documents.
 - 8. Operation and Maintenance manuals.
 - 9. Materials.
 - 10. Codes, inspections, and fees.
 - 11. Delivery, storage, and handling.
 - 12. Tests and settings.
 - 13. Manufacturers' services.
 - 14. Size of equipment.
 - 15. Enclosure types.
 - 16. Warranty.
- B. Furnish all labor, supervision, materials, equipment and incidentals required to make ready for use complete functional electrical systems as shown on the Contract Drawings and specified herein.
- C. The Work shall include furnishing, installing, interconnecting and testing the equipment and materials specified in all other Sections of the Division 26 Specifications and shown on the Contract Drawings.
- D. The Work shall include furnishing, coordinating, and installing the following:

1. Conduit, wire, field connections and installation for all motors, motor controllers, control devices, control panels, and "packaged" equipment furnished under other Divisions of these Specifications.
 2. Installation, mounting and field wiring for all field-mounted devices and instruments, furnished under other Divisions of these Specifications, which require on-site electrical or electronic wiring supply / terminations. All conduit, wire, and interconnections between devices, primary elements, transmitters, indicators, sensors, switches, alarms, control panels, etc. Installation of all cables and equipment furnished by instrumentation and electronic system suppliers and process control system suppliers.
 3. A complete raceway system for all cables furnished by electronic system suppliers, process instrumentation suppliers and process control system suppliers. Review the raceway layout with Supplier and the cable manufacturer, prior to installation, to insure raceway compatibility with the systems and materials being furnished.
 4. Installation of all control panels, controllers, etc. furnished under other Divisions of these Specifications.
 5. Complete, functional, fully installed, interconnected and tested systems for power, control, lighting, grounding, telephone, data, etc. as indicated in other Sections of Division 26 – Electrical, and as shown on the Contract Drawings.
 6. Unless specified otherwise, Contractor shall review the Shop Drawings of all electrically operated equipment and equipment with electrical connections furnished under all divisions of these specifications. Contractor shall wire and interconnect all materials, devices, components, systems and packages requiring "field wiring". Where applicable, Contractor shall make electrical interconnections per manufacturer's requirements. This includes, but is not limited to, devices that are parts of "packages" but which are shipped separately and require field connection. Also, Contractor shall identify terminals and prepare drawings or wiring tables to extent necessary to enable interconnections.
 7. Demolition, where required.
- E. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the Work of this Section or other applicable Sections shall be furnished at no extra cost.
- F. Where applicable, the Contractor or his authorized representatives shall, before preparing his proposal, visit all areas of the existing site, buildings and structures in which Work under this Section is to be performed and inspect carefully the present installation. The submission of the proposal by this Contractor shall be considered evidence that he or his representative has visited the buildings and noted the locations and conditions under which the Work will be performed and that he takes full responsibility for a complete knowledge of all factors governing his Work.
- G. Where applicable, all power interruptions to existing equipment shall be at the Owner's convenience with 72 hours (minimum) notice. Each interruption shall have prior approval.

- H. Where applicable, the Contractor shall maintain the existing facility in operation at all times.
- I. Temporary power connections as required shall be provided by the Contractor at no additional expense to the Owner. All temporary wiring shall be in accordance with the NEC. All temporary equipment feeders shall be installed in conduit. The Contractor shall provide to the Engineer details, methods, materials, etc. prior to making temporary connections. Furnish and install all equipment and materials including control equipment, motor starters, branch and feeder circuit breakers, panelboards, transformers, etc., for temporary power. Remove temporary installations prior to / at job completion.
- J. The Work shall include complete testing of all equipment and wiring at the completion of Work and making any minor correction changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.
- K. Where applicable, field identify and verify all existing underground structure and utilities, including electrical and mechanical piping.
- L. Where applicable, provide all electrical relocation work associated with the relocation of equipment for the existing and new facilities, including disconnection of all existing wiring and conduits and provision of new wiring from the point of electrical supply and conduit to the relocated equipment.
- M. Complete coordination with other contractors. Contractor shall coordinate with other contractors regarding each-others equipment and equipment submittals and shall obtain all relevant submittals.
- N. Seismic Requirements:
 - 1. Conform to the requirements indicated on the structural and other Contract Documents, where applicable.
 - 2. It shall be the responsibility of the equipment manufacturers and suppliers along with the Contractor to conform to the seismic design requirements based on the project's seismic zone and/or the Contract Documents.
 - 3. All electrical raceways and equipment shall utilize earthquake resistant supporting systems as required by the project's seismic zone and/or the Contract Documents.
 - 4. Electrical distribution and power control equipment shall be labeled by the equipment manufacturer as "seismic qualified." This labeling shall be indicative that representative samples of the same equipment have been tested and found to meet or exceed the seismic requirements of the I.B.C., U.B.C. and C.B.C. codes for the applicable project seismic zone. Contractor shall install such equipment in accordance with these codes and the manufacturer's recommendations. Equipment seismic labeling applies to panelboards, switchboards, motor control centers, busway, transfer switches, switchgear, network protectors, transformers, power

centers, metal enclosed switchgear, metal clad switchgear, load centers, safety switches and enclosed control assemblies.

O. Related Sections include but are not limited to:

1. Section 01 33 00 – Submittals.
2. All Division 26 – Electrical.

1.02 RELATED DOCUMENTS AND DEFINITIONS

- A. Contract Drawings, specifications and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other Sections of Division 26.
- B. “Drawings” or “Contract Drawings”, as used herein, refer to the Project Contract Drawings.
- C. “Specifications” or “Contract Specifications”, as used herein, refer to the Project Contract Specifications, which are part of the Contract Document.
- D. “Documents” or “Contract Documents”, as used herein, refer to the Project Contract Drawings, specifications, and general conditions and requirements.
- E. “Division 26”, as used herein, refers to all project Electrical Section Specifications (26 XX XX).
- F. “Contractor”, as used herein, refers to the Contractor (or his designated electrical sub-contractors and his electrical/etc. equipment manufacturers and suppliers who provide his
- G. equipment), who has responsibility to furnish and install the “Scope of Work”, as described herein and per the Contract Documents.
- H. The requirements of this Section apply to the entire Scope of Work including that shown on the Contract Drawings, in all Division 26 Section Specifications, and in the General and Supplementary Conditions, and Division 1 Specifications.

1.03 APPLICABLE STANDARDS/QUALITY ASSURANCE

A. All electric equipment, materials, and installation shall be in accordance with the National Electrical Code (NEC) and with the latest edition of all codes and standards of the following organizations:

1. National Fire Protection Association (NFPA), including (but not limited to):
 - a. National Electrical Code (NEC), NFPA 70.
 - b. National Fire Alarm Code, NFPA 72.
 - c. Life Safety Code, NFPA 101.
 - d. Emergency and Standby Power Systems, NFPA 110.
 - e. Standard for Fire Protection in Wastewater Treatment and Collection Facilities, NFPA 820.
2. American National Standards Institute (ANSI), including (but not limited to):
 - a. National Electrical Safety Code, ANSI C2.
3. Occupational Safety and Health Act (OSHA).
4. Federal Communication Commission (FCC).
5. National Electrical Manufacturers Association (NEMA).
6. Insulated Cable Engineers Association (ICEA).
7. Institute of Electrical and Electronics Engineers (IEEE).
8. National Electrical Testing Association (NETA).
9. American Society of Testing and Materials (ASTM).
10. Building Officials and Code Administrators International, Inc. (BOCA).
11. Southern Building Code Congress International (SBCCI):
 - a. Standard Building Code (SBC).
12. Uniform Building Code (UBC).
13. International Conference of Building Officials (ICBO).
14. International Energy Conservation Code.
15. National Electrical Contractors Association Installation Standards (NECA).
16. Americans with Disabilities Act (ADA).
17. All applicable state and local codes, amendments, regulations and practices.
18. Appropriate Authorities Having Jurisdiction.

B. Where codes and/or standards conflict, the most conservative document shall be followed.

- C. Per OSHA, all electrical equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL), or other Nationally Recognized Testing Laboratory (NRTL), and shall bear the appropriate UL or NRTL listing mark or classification marking. Equipment, materials, etc. utilized not bearing a UL or NRTL certification shall be field certified by UL or NRTL prior to equipment acceptance and use.
- D. Where reference is made to one of the above standards, the revision in effect at the time of Bid opening shall apply.

1.04 INTERPRETATION OF DRAWINGS

- A. Electrical loads (KVA, KW, Horsepower, Amperes, etc.) and wiring requirements indicated on the electrical Drawings are estimates representative of standard process, mechanical and building equipment. Electrical equipment ratings, bus ratings, circuit wire sizes, circuit wire quantities, conduit sizes, conduit quantities and overcurrent protection device ratings indicated on the Drawings are based on such equipment. Contractor is advised that prior to installation he must compare indicated electrical equipment ratings, wire sizes and quantities, conduit sizes and quantities and overcurrent protective device ratings versus approved shop drawings of actual equipment being furnished. Contractor shall provide electrical materials conforming to the requirements of the actual equipment being furnished, reflecting increased ratings, wire sizes and quantities, conduit sizes and quantities and overcurrent protective device ratings where required to match shop drawings. Overcurrent protective device ratings shall be decreased if required to match actual equipment requirements and/or manufacturer's recommendation. Other electrical ratings, wire sizes and quantities and conduit sizes and quantities shall not be decreased to less than that indicated on the Contract Drawings.
- B. Equipment short circuit interrupting and/or withstand ratings as shown on the Contract Drawings and/or as specified equal or exceed design Engineer's calculated values based on standard data available at the time of design. Contractor shall furnish equipment meeting these ratings or shall furnish higher rated equipment if and when required based on the results of the Short Circuit Study (see Section 1.18). In no case, shall equipment with ratings lower than those shown on the Contract Drawings and/or specified (based on design Engineer's calculated values) be permitted.
- C. The Contract Drawings are not intended to show exact locations of equipment or conduit runs.
- D. Unless otherwise approved by the Engineer, conduit shown or specified exposed shall be installed exposed; conduit shown or specified concealed shall be installed concealed.
- E. Where circuits are shown as "home-runs", all necessary fittings and boxes shall be provided for a complete raceway installation.

- F. Verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
- G. Any work installed contrary to or without approval by the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.
- H. The locations of equipment, fixtures, outlets, and similar devices shown on the Contract Drawings are approximate only. Exact locations shall be as determined in field by Contractor, during construction, after coordination with the Owner and /or his designated representative and approval by the Engineer. Obtain in the field all information relevant to the placing of electrical work, and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
- I. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers (minimum 1/2-inch) to provide a clearance between wall and equipment.
- J. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of equipment.
- K. All connections to equipment shall be made as required, and in accordance with the approved shop and setting drawings. All outdoor location connections shall be watertight.
- L. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment, and/or layout other than specified herein, shall be done by the Contractor at his own expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his own or others, caused by such redesign.
- M. The Contractor shall coordinate his work with the work of the different trades so that interferences between conduits, piping, equipment, architectural and structural work will be avoided. All necessary offsets shall be furnished so as to take up a minimum space and all such offsets, fittings, etc., required to accomplish this shall be furnished and installed by the Contractor without additional expense to the Owner. In case interference develops, the Engineer is to decide which equipment, piping, etc., must be relocated, regardless of which was installed first.
- N. Where installation of new, active, conduit runs are called for or indicated in the Contract Documents, in locations which will become "inaccessible" after installation is complete, (such as underground, or in concrete encasement, or in concrete slabs, or similar application), Contractor shall furnish and install spare conduits of similar type and size, for the entire "inaccessible" part of such conduit runs. Quantity of additional spare conduits shall be such that the number of additional spare conduits (or, with Engineer's approval, the cumulative cross-sectional area) shall be equivalent to 20% or more of the active

conduits. Such spare conduits will generally not appear on the Contract Drawings but shall be included. All spare conduits shall include pull strings.

- O. Conduits and cables called for or indicated in the Contract Documents as having 8 or more installed control wires, shall be supplemented by Contractor to include 20% additional spare control wires. Where such additional wires require increase in conduit size, Contractor shall furnish and install larger conduit. Such spare wires will generally not appear on the Contract Drawings but shall be included.
- P. Dimensions. Dimensions indicated on the Contract Drawings related to electrical equipment locations and /or clearances (relative to walls, column lines, other equipment, etc) are generally minimum clear dimensions to be maintained as per Code, AHJ, project and / or operating requirements. Such dimensions shall be maintained or exceeded, but not reduced, regardless of actual equipment sizes which will only be determined after approval of project specific manufacturer's drawings. Concrete pads, vaults, structures, etc for electrical equipment, where dimensioned on the Drawings, are estimated dimensions based on typical catalog sizes of electrical equipment on which the design is based. Such dimensions shall be adjusted by Contractor if / as necessary based upon project specific approved manufacturer's drawings.
- Q. Conduit and wiring between electrical "field" utilization equipment, loads, motors, instrumentation, etc. and their respective "source" switchgear, motor control center, panelboard, PLC, termination cabinet, etc. are generally shown on the Drawings as "homeruns". Similarly, conduit and wiring between panels are shown as "homeruns". Contractor's scope, under this Section, shall include determination of the most suitable physical routing of such "homeruns", considering Owner preferences, building layouts, existing conditions, ease of installation, interferences, etc. Where multiple "homeruns" of instrumentation "digital control (120 VAC)" or "analog control (4-20 mA DC)" wiring run from the same "field" location or from the same panel to the same "source" location, Contractor may combine multiple wiring circuits into larger (common) conduits so as to provide an economical and practical installation. However, "digital" and "analog" wiring shall not share the same (common) conduits with each other, except for digital 24VDC control and 4-20 mA DC analog control signal cables which may share the same conduit. Contractor shall not combine power wiring into larger (common) conduits except in limited situations as specifically allowed by the Contract Documents. Contractor shall prepare Coordination Drawings (Paragraph 1.07) clearly indicating "homerun" routing and combining of multiple wiring into common conduits, as permitted, for Approval before execution of the installation.
- R. Overall underground electrical ductbanks are shown on the electrical site plans. Final stub-up locations (entry/exit) into equipment inside electrical rooms and at each site area shall be field coordinated and determined by Contractor.
- S. Equipment drawings shall be used to determine where embedded conduits may be stubbed- up at or beneath equipment. For all embedded conduits, Contractor shall determine routing of conduit based on site conditions.

- T. Conduits embedded in concrete slab shall not interfere with equipment or building structures. Interferences with embedded conduits stubbed-up up at or beneath equipment shall also consider accessibility at such equipment. Interferences with embedded conduits shall be the Contractor's responsibility and cost to remedy.
- U. Spare empty conduits shall be installed embedded in slabs as required, and as part of underground ductbanks according to Division 26 specifications. All spare conduits shall include pull strings.

1.05 PRIORITY OF THE CONTRACT DOCUMENTS

- A. If during the performance of the Work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and Drawings, furnish the higher performance requirements. The higher performance requirements shall be considered the equipment, material, device or installation method that represents the most stringent option, the highest quality, or the largest quantity.
- B. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.
- C. Detailed drawings shall govern over general drawings, larger scale drawings take precedence over smaller scale drawings and change order drawings shall govern over Contract Drawings. Contract Drawings shall govern over shop drawings until shop drawings have been approved by the Engineer. Once shop drawings have been approved, by the Engineer, they shall become the governing documents. Nevertheless, should an approved shop drawing contain a conflict, omission and / or error, contrary to the Contract Drawings and / or Contract Documents, so as to void or diminish the original intent of the Contract Drawings and /or Contract Documents, then the Contract Drawings and / or Contract Documents shall govern.
- D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provision of the Contract Documents will take precedence if they are more stringent or cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between laws and regulations, the higher performance requirements shall be binding on the Contractor, unless otherwise directed by the Engineer.
- E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time, nor limit in any way the Contractor's responsibility to comply with all Laws and Regulations at all times.

1.06 SUBMITTALS

- A. Submit to the Engineer, in accordance with the Section 01 33 00 - Submittals, and copies of all materials required to establish compliance with this Section. Submittals shall include at least the following:

- B. Shop drawings shall be submitted for the following equipment:
 - 1. Switchgear.
 - 2. Substations.
 - 3. Switchboards and Panelboards.
 - 4. Medium Voltage Motor Control Centers.
 - 5. Low Voltage Motor Control Centers.
 - 6. Variable Frequency Drives.
 - 7. Transformers.
 - 8. Reduced Voltage Starters.
 - 9. Lighting Fixtures and Lamps.
 - 10. Manholes, Pullboxes and Handholes, Frames and Covers.
 - 11. Grounding Hardware and Connections.
 - 12. Raceways, Boxes, Fittings and Hangers.
 - 13. Wires and Cable.
 - 14. Switches, Receptacles and Covers.
 - 15. Lightning Protection System.
 - 16. Fire Alarm System.
 - 17. Acceptance Testing Plan.

- C. Resubmittals. When a resubmittal is required the Contractor shall submit all previously accepted material in addition to the corrected or added information. It is intended that each resubmittal be a complete and stand-alone document.

- D. The Manufacturer's name and product designation and catalog numbers shall be submitted for the following material utilized:
 - 1. Testing Equipment.
 - 2. Ground System Resistance Test Equipment.

- E. Prior to submittal, all shop drawings shall be checked for accuracy and Contract requirements. Shop drawings shall bear the date checked. In addition, each shop drawing

submitted shall include a copy of the applicable Section, with addendum updates included, and all referenced and applicable Sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up Sections, along with justifications for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

- F. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the Contract Specifications and Contract Drawings. The Engineer's review shall not change the requirements of the Contract Documents, nor shall this review relieve the Contractor of errors in shop drawings. The responsibility of, or the necessity of, furnishing materials and workmanship required by the Contract Specifications and Contract Drawings, which may not be indicated in the shop drawings, is included as Work under this Section.
- G. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this Work with the work of all other trades is also included under the Work of this Section.
- H. No material shall be ordered or Shop Work started until the Engineer's approval of shop drawings has been given.
- I. In addition to Manufacturer's equipment shop drawings, the Contractor shall submit for approval electrical coordination/installation working drawings. See paragraph 1.07.
- J. Submit Record Documents. See Paragraph 1.08
- K. Submit Operation and Maintenance Manuals. See Paragraph 1.09.

1.07 COORDINATION DRAWINGS

- A. Prepare electrical coordination/installation working drawings to scale of 1/4-inch = 1-foot or larger, detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access, and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of all raceway systems, equipment, and materials. Include the following:

- a. Size of equipment and clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
 - b. Exterior wall and foundation penetrations.
 - c. Fire-rated wall and floor penetrations.
 - d. Equipment connections and support details.
 - e. Sizes and location of required concrete pads and bases.
 - f. Sizes and locations of man-holes, hand-holes, pull boxes, etc.
- 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 - 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings, and their relationship to other penetrations and installations.
 - 4. Particular attention shall be directed toward concealed and buried conduit layouts. The drawings shall be prepared based on approved equipment shop drawings and shall accurately locate and dimension all conduit stub-ups. Contractor shall assure that no concrete floors or walls are poured until such layouts are approved.
 - 5. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, and other ceiling-mounted devices.
- B. These coordination drawings shall be submitted to and approved by Engineer prior to installation by Contractor.

1.08 RECORD DOCUMENTS

- A. Prepare record documents indicating installed conditions, in conformance with the requirements of Section 01 78 00 – Closeout Submittals, for:
 - 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 - 2. Equipment locations (exposed and concealed) dimensioned from prominent building lines.
 - 3. Approved substitutions, contract modifications, and actual equipment and materials installed.
 - 4. Record power one-line diagrams, panel schedules, control diagram and fire alarm riser diagrams.
 - 5. GPS coordinates for electrical manholes and underground ductbanks.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Prepare operation and maintenance manuals include the following information for equipment items, in conformance with the requirements of Section 01 78 00 – Closeout Submittals:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.

B. Operation and Maintenance Data

1. Submit complete operations and maintenance data for all equipment furnished under this Division. The manuals shall be prepared specifically for the installation and shall include all required cuts, drawings, equipment lists, descriptions, complete parts list, etc, that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

1.10 MATERIALS

A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Sample of materials or Manufacturers shall be submitted for approval as required by the Engineer.

B. All current carrying cables, wires, buses, terminals, windings, parts, etc. shall be copper.

C. Equipment shall be suitable in all ways for the intended application. Ratings shall match or exceed the requirements of the indicated Reference Standards, Drawings and Specifications. Electrical short circuit interrupting ratings shall meet the requirements of NEC Article 110. Additionally, electrical equipment shall have fully rated interrupting ratings. Equipment employing "series" rated interrupting capabilities shall not be acceptable.

D. Electrical equipment shall at all times during construction be adequately protected against mechanical damage, water damage, corrosion, dirt, dust and foreign material. Equipment equipped with internal electrical heaters shall have them energized to keep the equipment dry. Doors to cabinets, panelboards, motor control centers, switchgear, control panels and other similar equipment shall be kept closed at all times when work on them is not being done. Switchgear, motor control center, panelboards and similar Electrical equipment shall not be stored out-of-doors. Such Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been subject to possible injury by water, it

shall be replaced at no additional cost to the Owner, the damaged units or systems shall remain on site and returned to the manufacturer after the replacement units or systems have been delivered to the site. Under no circumstances will electrical equipment damaged by water be rehabilitated or repaired, new equipment shall be supplied, and all costs associated with replacement shall be borne by the Contractor. All electrical devices shall be finger safe type.

- E. Any damage to factory applied paint finish shall be repaired using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted per the field painting specification, at no additional cost to the Owner.

1.11 CODES, INSPECTIONS AND FEES

- A. All equipment, materials, and installation shall be in accordance with the requirements of the local authority having jurisdiction.
- B. Contractor shall obtain all necessary permits, inspections, certificates of acceptance, certificates of occupancy, etc. Contractor shall pay all fees related to these items. Contractor shall submit to the Authority Having Jurisdiction the necessary Contract Drawings in the size and quantity as required by the Authority Having Jurisdiction. These permits, inspections, and certificates shall cover all aspects of the electrical systems, including the fire alarm system. The permits, inspections and certificates shall be obtained by Contractor from the appropriate authority having jurisdiction including, but not limited to, building departments, inspection authorities, plan review examiners, fire marshals, insurers, etc.
- C. Obtain required inspection stickers indicating installation suitability from the local authority having jurisdiction. Install as directed by authority having jurisdiction.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Inspect products for completeness and conditions; if it is to be stored, reseal for protection; unpack and handle equipment in accordance with manufacturer's recommendations.
- C. Store products in dry spaces, free from corrosives. Heat storage areas to prevent condensation, and dust free. Keep equipment clean by covering or by other measures as necessary. Store shipping section on level surfaces.
- D. Store equipment and material under cover, and off the ground or floors exposed to rain.
- E. For outdoor storage, protection covers of 10-mil thick black sheet plastic shall be fitted. Covers shall be reinforced to withstand wind and precipitation. Set materials on skid or platforms of height to avoid damage or deterioration from spattering and ground waste.

1.13 TESTS AND SETTINGS

- A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.

- B. Make the following minimum tests and checks prior to energizing electrical equipment:
 - 1. Testing as outlined in NETA Section 16T, Electrical Acceptance Tests.
 - 2. Mechanical inspection, testing and setting of all circuit breakers, disconnect switches, motor starters, control equipment, etc. for proper operation.
 - 3. Specific equipment and systems tests as indicated in the individual 16XXX Sections.
 - 4. Check all wire and cable terminations. Verify to the Engineer connections meet the equipment's torque requirements.
 - 5. Field set all transformers taps as required to obtain the proper secondary voltage.
 - 6. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
 - 7. Check the ampere rating of all thermal overloads for motors and submit a typed record to the Engineer of same, as well as locations and designations, listing the nameplate service factor, horsepower, and full load current. If inconsistencies are found, new thermal elements shall be supplied and installed by this Contractor.
 - 8. Check rotation of all motors, obtain permission from the Engineer to start the motors, and proceed to check it for proper rotation. If it rotates in the wrong direction, correct rotation at the motor. Take all necessary precautions not to damage any equipment.
 - 9. Carefully check interlocking, control and instrument wiring for each system, and/or part of a system to ascertain that the system will function properly and as indicated by schematic and wiring diagrams where applicable.
 - 10. Provide all instruments, personnel and equipment required for the tests specified herein.
 - 11. Manufacturers' Certified Reports. The equipment manufacturer, or his authorized representative shall submit a notarized written report with respect to his equipment certifying that (1) the equipment has been properly installed, wired and connected under his supervision, (2) the equipment is in accurate alignment, (3) he was present when the equipment was placed in operation, (4) he has checked, inspected and adjusted the equipment as necessary, (5) the equipment has been operated under full load conditions and operated satisfactorily and (6) the equipment is fully covered under the terms of the guarantee. Reports shall be submitted for the following equipment: Substations, Switchgears, Switchboards, Motor Control Centers, Variable Frequency Drives, Solid Rate Reduced Voltage Starters and Fire Alarm Systems.

- C. All testing shall be scheduled and coordinated by the Contractor. Notify the Owner at least two (2) weeks in advance of conducting tests. The Contractor shall have qualified personnel present during all testing.

D. Where applicable, the following additional tests and checks shall be made prior to the energizing of electrical equipment. Contractor shall engage the services of an independent testing firm. Tests shall be conducted by the independent testing firm, and a certified test report shall be submitted stating that the equipment meets and operates in accordance with the manufacturers and job specifications, and that equipment and installation conforms to all applicable standards and specifications:

1. Testing of protective relays for calibration and proper operation.
2. Over potential, high potential, insulation resistance, and shield continuity tests for cables.
3. Mechanical inspection of switches and circuit breakers to assure proper operation.

Subsequent to Energization:

1. Infra-red hot spot inspection shall be made of all switchgear, switches, power and control panels. This shall be done under representative load conditions before the equipment is used by the Owner and again three (3) months before expiration of the one (1) year warranty period.
2. Three (3) copies of certified test reports shall be furnished to the Engineer for all tests.

E. Source Quality Control

1. Factory Tests. Factory tests are required for all electrical equipment and assemblies. Perform factory tests in accordance with the codes and standards specified as applicable to the equipment.
2. Factory Inspection. Owner or his representative may inspect fabricated electrical equipment at the factory. Notify Owner in sufficient time so that factory inspection can be arranged. Factory inspection will be made after manufacturer has performed satisfactory checks, adjustments, tests and operations. Approval of equipment at the factory only allows the manufacturer to ship the equipment to the site and does not constitute final acceptance.

F. Certification and Tests

1. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.
2. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems demonstration.
3. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment systems.

1.14 MANUFACTURER'S SERVICES

A. Provide Manufacturer's services for testing and start-up of the following equipment:

- | | |
|---|--------------------------------------|
| 1. Panelboards | Not required. |
| 2. Transformers | Not required. |
| 3. Uninterruptible Power Supplies (UPS) | Minimum two (2) days, two (2) trips. |

B. The Manufacturers of the above listed equipment shall provide an experienced Field Service Engineer to accomplish the following tasks:

1. The equipment shall be visually inspected upon completion of installation and prior to energization to assure that wiring is correct, interconnection complete and the installation is in compliance with the Manufacturer's criteria. Documentation shall be reviewed to assure that all Contract Drawings, operation and maintenance manuals, parts list and other data required to check out and sustain equipment operation is available on-site. Documentation shall be red-lined to reflect any changes or modifications made during the installation to assure correct type and quantity.
2. The Field Service Engineer shall provide engineering support during the energization and check-out of each major assembly. They shall perform any calibration or adjustment required for the equipment to meet the Manufacturer's performance specifications.
3. Upon satisfactory completion of equipment test, they shall provide engineering support of system tests to be performed in accordance with Manufacturer's test specifications.
4. Minimum of three (3) four (4) hour training sessions on operation, and three (3) four (4) hour training sessions on maintenance and trouble-shooting procedures shall be provided for the Owner's maintenance personnel. All training shall be conducted at a facility provided by the Owner. The maintenance and trouble-shooting sessions shall be conducted with record "as-built" electrical drawings sufficient for a class of eight (8) personnel.
5. A final report shall be written and submitted to the Contractor and Engineer within fourteen (14) days from completion of final system testing. The report shall document the inspection and test activities, define any open problems and recommend remedial action.
6. A certificate of proper installation shall be issued by the manufacturer of the following equipment:
 - a. Uninterruptible Power Supplies (UPS)
 - b. Transformers.
 - c. Any other equipment as required by the Engineer.

1.15 SIZE OF EQUIPMENT

- A. Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the structure.
- B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passing through such restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to ensure that the tilting does not impair the functional integrity of the equipment.

1.16 ENCLOSURE TYPES

- A. Unless otherwise specified herein or shown on the Drawings, electrical enclosures shall have the following ratings.
 - 1. NEMA 1A gasketed for electrical rooms, control rooms and other dry, non-process indoor locations.
 - 2. NEMA 4X stainless steel for indoor process locations or other "CORROSIVE" locations. Hardware shall be stainless steel.
 - 3. NEMA 4X stainless steel for outdoor locations, rooms below grade (including basements and buried vaults), "DAMP" and "WET" locations. Hardware in outdoor locations shall be stainless steel.
 - 4. NEMA 7 (and listed for use in the area classifications shown) for "Class I, Division 1" and "Class I, Division 2" Hazardous Locations. Enclosure material shall be cast malleable iron.
 - 5. Factory Finishes. Unless otherwise specified in other Division 26 Sections, the sheet metal surfaces of equipment enclosures shall be phosphatized and coated with a rust resisting primer. Over the primer, apply a corrosion resistant baked enamel finish on the interior and exterior metal surfaces. The color shall be ANSI No. 49 medium light gray. Furnish hardware that is corrosion resistant. Finish cast-iron outlet bodies, boxes, covers and fittings with cadmium zinc electroplate covered with aluminum cellulose lacquer. In process and corrosive areas, all surfaces of rigid steel conduit, cast metal boxes, cast metal outlet bodies, covers, fittings, supports and clamps shall have a polyvinyl chloride coating bonded to the outer surface and the hardware shall be Type 316 stainless steel. Sheet metal enclosures, in process and corrosive areas, shall be stainless steel.

1.17 GUARANTEE AND WARRANTY

- A. Guarantee all Work of Division 26 in accordance with Section 01 78 36 – Warranties and Bonds.
- B. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

- C. Provide a warranty for all electrical equipment in accordance with the general requirements of specification. Unless specified more stringently elsewhere in the general requirements, the components of the electrical system shall be warranted for a period of one (1) year from the date of final acceptance, against defective materials, design and workmanship.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Where possible, materials of the same type shall be the product of one (1) manufacturer.

PART 3 - EXECUTION

- A. See Applicable Division 26 Sections.

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SECTION 26 05 05
WIRE AND CABLE (600V)

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing labor, materials and equipment, tools and incidentals for complete and operable wire and cable systems.
- B. Work in this Section includes:
 - 1. Building wire.
 - 2. Cable.
 - 3. Wiring connections and terminations.
- C. Related Sections include but are not limited to:
 - 1. Section 01 33 00 – Submittals.
 - 2. Section 26 00 00 – General Electrical Requirements.

1.02 REFERENCES

- A. Publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designations only.
 - 1. National Electrical Manufacturers Association (NEMA).
 - a. NEMA WC-5 – Suitable for Direct Burial Chemical Oil and Moisture Resistant, Crush and Abrasion Resistant, Sunlight Resistant, ROHS Compliant.
 - 2. Instrument Society of America (ISA).
 - a. ISA 12.6 – Wiring Practices for Hazardous (Classified) Locations.
 - 3. National Electric Codes (NEC).
 - 4. Underwriters Laboratories Inc. (UL).
 - 5. American National Standards Institute (ANSI).

1.03 SUBMITTALS

- A. Submit product data in accordance with the requirements of Section 01 33 00 – Submittals.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Low Voltage Conductors: Cablec; Collier; Okonite; Pirelli; Southwire; Triangle; or approved equal.
- B. Signal Circuit Conductors: Belden; Dekoron; Penn; or approved equal.
- C. Low Voltage Connectors: Burndy; Thomas & Betts; Ideal; OZ; or approved equal.
- D. Pulling Compounds: Ideal Yellow 77; Electro Y-ER-EAS; Minerallac 100; Burndy Slikon; or approved equal.

2.02 BUILDING WIRE

- A. Thermoplastic insulated Building Wire: NEMA WC 5.
- B. Cross linked polyethylene- insulated.
- C. Feeder and Branch Circuits: Single stranded conductor; 98% conductivity copper; 75/90°C; 600 volt PVC insulated with nylon jacket; type THWN/THHN. Minimum size #12 AWG.
- D. Feeder Conductors larger than 250 KCMIL; single stranded conductor copper; 90°C; 600 volt; flame retardant moisture resistant cross linked polyethylene insulated; type XHHW-2; minimum size 300 KCMIL.
- E. Control Circuits: Same as specified above for feeder and branch circuits, except minimum size #14 AWG.

2.03 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor; 600 volt insulation, rated 60 degrees C; individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.
- B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 60 degrees C, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.
- C. Instrumentation Signal Cables: #16 AWG stranded tinned copper conductors; 300 volt polyethylene insulation; twisted pair or three conductor construction; 100% coverage aluminum polyester shield; #16 stranded tinned copper drain wire; vinyl outer jacket; UL listed.

2.04 HIGH TENSION LEADWIRE

- A. Conductors: #16 AWG stranded tin coated copper conductor insulated with extruded flame-retardant (VW-1) 150°C silicone rubber rated 30 KVDC.UL style 3239. National Wire and Cable Corporation Catalog No. NHVSR 302630 or approved equal.

PART 3 - EXECUTION

3.01 GENERAL WIRING METHODS

- A. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring.
- B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75-feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200-feet.
- C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- D. Identification: All conductors shall be identified throughout the electrical system. For control and signal conductors use wire markers at all terminals and connections. Each cable shall have From / To identification tag. Color code power circuit conductors as follows:

	120/208 Volt System	277/480 Volt System
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Ground	Green	Green

For conductors #8 AWG and larger color coding may be accomplished with 1-inch wide colored tape applied at each end of the conductor or at points where conductor is accessible so as to be visible inside the enclosure.

- E. Neatly train and lace wiring inside boxes, equipment, and panelboards. Support to prevent conductor movement under fault conditions.

3.02 WIRING INSTALLATION IN RACEWAYS

- A. Unless otherwise indicated, install all conductors in conduit.
- B. Pull all conductors into raceway at the same time. Thoroughly swab raceway system before installing conductors. Use wire pulling lubricate for all pulls. Do not exceed the manufacturers pulling tension.

- C. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- D. All cable preparation shall be performed to cable manufacturer's specifications. These specifications shall be presented for inspection to the Construction Manager before cable terminations are performed.
 - 1. As all wiring contains stored energy (capacitance and inductance), all conductors must be considered when determining the length of intrinsically safe circuits. When available, the actual values of capacitance and inductance for the specific wire being used should be referenced. If these are not available, values of 60pF/foot for capacitance per wire pair and 0.2H/foot for inductance are accepted and may be used.

The following items apply only to installations using zener diode type safety barriers.

- 2. All ground path connections must be secure, identified, visible, and accessible for routine inspection.
- 3. Where shielded cables are used, they must be bonded to ground and "taped back". For installation options, please refer to the ISA RP 12.6 standard.
- 4. Cables in manholes and handholes shall have extra loop slacks.

3.03 WIRING CONNECTIONS AND TERMINATIONS

- A. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes. Do not allow splices for conductors over #1/0 without Engineer's approval. There shall be no splices in electrical manholes and handholes. Where splicing is approved or necessary, then splicing material shall be approved by the Engineer and cable manufacturer. The conductivity of all completed connections shall be not less than that of the uncut conductor. The insulation resistance of all completed connections of insulated conductors shall be not less than that of the uncut conductor.
- B. Make connections to circuit breakers, disconnect switches, panel mains, etc. with solderless lugs.
- C. Use mechanical connectors for low voltage splices, taps, fixture and motor connections.
- D. Use insulated throat, spade type crimp on connectors for strap screw device terminals.
- E. Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150 percent of the insulation value of conductor.
- F. Thoroughly clean wires before installing lugs and connectors.

- G. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

3.04 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Torque test conductor connections and terminations to manufacturer's recommended values.
- C. Continuity Tests: Ring all conductors for continuity and replace any open conductors.
- D. Low Voltage Ground Fault Tests: Meggar all feeder circuits for grounds. Compile and submit a list of meggar readings. Replace all conductors measuring less than 2 megohms to ground.

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SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.01 SCOPE

- A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.
- B. Documents and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- C. Related Sections include but are not limited to:
 - 1. Section 01 33 00 – Submittals.

1.02 REFERENCES

- A. Publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designations only.
 - 1. American Society for Testing and Materials (ASTM).
 - a. ASTM B3 – Specification for Soft or Annealed Copper Wire.
 - b. ASTM B8 – Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
 - c. ASTM B33 – Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes.
 - 2. National Electrical Code (NEC).
 - a. NEC – National Electrical Code.
 - 3. Underwriters Laboratories Inc. (UL).
 - a. UL 467 – Standard Grounding and Bonding Equipment.
 - b. UL 486A and UL 486B – Standard Wire Connectors.
 - 4. National Fire Protection Association (NFPA).
 - a. NFPA 70 – National Electrical Code.

1.03 SUBMITTALS

- A. General: Submit each item in this Article according to the requirements of Section 01 33 00 - Submittals.

- B. Product Data for grounding rods, connectors and connection materials, and grounding fittings.
- C. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the international Electrical Testing Association (NETA).
 - 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3 of this Section.
- B. Comply with NFPA 70.
- C. Comply with UL 467.
- D. Listing and Labeling: Provide products specified in this Section that are UL listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
- E. See Also Spec 26 00 00 – General Electrical Requirements, Part 1 for listing of applicable reference standards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Apache Grounding; Nashville Wire Products.
 - 2. Chance: A. B. Chance Co.
 - 3. Erico Products- Cadweld.
 - 4. Burndy Co.
 - 5. Fushi Int.- Copperweld

6. Continental Industries – Thermoweld.
7. Heary Brothers Lightning Protection Co.
8. Ideal Industries, Inc.
9. Kearney.
10. Lightning Master Corp.
11. O-Z/Gedney Co.
12. Thomas & Betts, Electrical.
13. Or approved equal.

2.02 GROUNDING AND BONDING PRODUCTS

- A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirement and the greater size, rating, and quantity indications shown shall be adhered.

2.03 WIRE AND CABLE GROUNDING CONDUCTORS

- A. Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductors: Insulated with green color insulation.
- C. Grounding-Electrode Conductors: Stranded copper cable.
- D. Underground Conductors: Bare, tinned, stranded copper except as otherwise indicated.
- E. Bare Copper Conductors: Conform to the following:
 1. Solid Conductors: ASTM B 3.
 2. Assembly of Stranded conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.

2.04 MISCELLANEOUS CONDUCTORS

- A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- B. Braided Bonding Jumpers: Copper tape, braided No. 3/0 AWG bare copper wire, terminated with copper ferrules.
- C. Bonding straps: Soft copper, 0.05-inch thick and 2-inches wide, except as indicated.

2.05 GROUNDING PRODUCTS

- A. Pressure connectors: High-conductivity-plated units.

- B. Bolted Clamps: Heavy-duty type.
- C. Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combination of conductors and connected items.

2.06 GROUNDING ELECTRODES AND TEST WELLS

- A. Grounding Rods: Copper-clad steel.
 - 1. Size: 3/4-inch by 120-inches.
- B. Test Wells: Grounding rod, as above, driven through drilled hole in bottom of handhole. Handhole minimum size 12-inch x 1-inch x 12-inch with cover. See 3.02 below.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Equipment grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 1. Install equipment grounding conductor with circuit conductors for the items below in addition to those required by Code:
 - a. Feeders and branch circuits.
 - b. Lighting circuits.
 - c. Receptacle circuits.
 - d. Single-phase motor or appliance branch circuits.
 - e. Three-phase motor or appliance branch circuits.
 - f. Flexible raceway runs.
 - 2. Metallic Raceways: Raceways, conduits and cable trays, etc. shall be made electrically and mechanically continuous, and shall be bonded/ grounded to earth. Utilize jumpers, clamps, etc. as necessary to meet requirements for NEC. Install a grounding conductor in each metallic raceway, conduit and cable tray.
 - 3. Nonmetallic Raceways: Install a grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
- B. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide a No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location, backboard, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central equipment Locations and wiring Closets: Terminate grounding conductor on a 1/4-inch x 2-inch x 12-inch grounding.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

- C. Separately Derived Systems: Where NEC requires grounding, ground according to NEC.
- D. Metal Poles Supporting Exterior Lighting Fixtures: Ground pole to a grounding electrode in addition to separate equipment grounding conductor run with supply branch circuit.
- E. Grounding and Bonding for Piping and Metallic Parts:
 - 1. Ground and bond piping to meet NEC and requirement of local Authority Having Jurisdiction.
 - 2. Ground and bond metallic structures, supports, fences, handrails, misc. metallic parts and similar items which are in proximity to electrical equipment, conduit and wiring and which are likely to become electrified upon fault or short of the electrical equipment, conduit or wiring.
- F. Grounding and Bonding Metal Air Ducts: Ground and Bond metal air ducts to equipment grounding conductors of associated fans, blowers, heaters and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.02 INSTALLATION

- A. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- B. Grounding Electrode System: Where available on the premises, at each building or structure served, a metal underground water pipe, the metal frame of the building or structure, concrete encased electrodes, any ground ring encircling the building or structure and all made electrodes (ground rods, etc.) shall be bonded together to form the grounding electrode system. The main bonding jumper and the grounding electrode conductor shall be installed and sized per NEC except where larger sizes than required by NEC are indicated.
- C. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

3.03 CONNECTIONS

- A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel with tin-plated copper jumpers and mechanical clamps.

- 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
 - C. Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
 - D. Non-contact metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at both entrances and exits with the grounding conductors, except as otherwise indicated.
 - E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
 - F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
 - G. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.
- 3.04 FIELD QUALITY CONTROL
- A. Testing Agency: Engage an electrical testing organization to perform tests described below.
 - B. Test: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81
 - C. Maximum grounding to resistance values are as follows:
 - 1. Equipment rated 500 KVA and Less: 10 ohms.
 - 2. Unfenced Substations and Pad-Mounted Equipment: 5 ohms.

3. Manhole Grounds: 10 ohms.

- D. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.
- E. Report: Prepare test reports, certified by the testing organization, or ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.05 ADJUSTING AND CLEANING

- A. Restore surface features, including vegetation, at areas disturbed by work in this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include topsoil, fertilizer, lime, seed, sod, sprigs, and mulch. Maintain restored surface. Restore disturbed paving to the original condition.

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SECTION 26 05 33

CONDUIT

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing, labor, materials and equipment, tools and incidentals for complete and operable conduit.
- B. Work in this Section includes:
 - 1. Rigid metal conduit and fittings.
 - 2. Flexible metal conduit and fittings.
 - 3. Liquidtight flexible metal conduit and fittings.
 - 4. Non-metallic conduit and fittings.
- C. Related Sections include but are not limited to:
 - 1. Section 01 33 00 – Submittals.

1.02 REFERENCES

- A. Publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designations only.
 - 1. National Electrical Manufacturers Association (NEMA).
 - a. NEMA FB-1 – Standard, Fittings, Cast Metal Boxes and conduit Bodies for Conduit Electrical Metallic Tubing (EMT) and Cable.
 - b. NEMA RN-1 – Standard, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit (IMC).
 - c. NEMA TC-3 – Standard, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
 - 2. Underwriters Laboratory Inc. (UL).
 - a. UL 6 – Standard, Electrical Rigid Metal Conduit – Steel.
 - b. UL 886 – Standard, Outlet Boxes and Fittings for use in Hazardous (Classified) Locations.
 - 3. American National Standards Institute (ANSI).
 - a. ANSI C80.1 - Standard for Electric Rigid Steel Conduit (ERSC).

1.03 SUBMITTALS

- A. Submit product data in accordance with the requirements of Section 01 33 00 - Submittals.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Conduit: Allied, Republic, Triangle, Wheatland, or approved equal.
- B. PVC Coated Rigid Steel Conduit: Permacote, Robroy, Ocal, Inc., or approved equal.
- C. PVC Conduit: Amoco, Carlon, Certainteed, or approved equal.
- D. Flexible Conduit: Anamet, Columbia, Electric Flex, or approved equal.
- E. Fittings: Appleton, Crouse-Hinds, O-Z/Gedney, Thomas & Betts, or approved equal.

2.02 RIGID METAL CONDUIT AND FITTINGS

- A. PVC Coated Rigid Steel Conduit: NEMA RN-1; galvanized rigid steel conduit with factory applied external 40 mil PVC coating and urethane interior coating. Prior to coating, treat conduit with a heat polymerizing adhesive so the bond between metal and coating is greater than the tensile strength of the coating. Minimum size 3/4-inch.
- B. Fittings and Conduit Bodies: NEMA FB-1; zinc coated; taper-threaded type, material to match conduit. Where PVC coated rigid steel conduits are indicated all couplings, fittings, conduit bodies, pipe straps, U bolts, beam clamps, and other accessories shall have factory applied PVC coating of the same standards as the straight sections of conduit or stainless steel. This includes, but not limited to fittings, hangars, supports, fasteners and hardware. All metallic conduit bodies, fittings, boxes, etc. in Class 1, Division 1 hazardous areas shall be explosion proof / NEMA 7 (in strict accordance with NEC Chapter 5).

2.03 FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Conduit: UL 1; FS WW-C-566; single steel continuous strip with galvanized coating. Minimum size 1/2-inch.
- B. Fittings and Conduit Bodies: Stainless steel. This includes, but not limited to fittings, hangars, supports, fasteners and hardware.

2.04 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: UL listed liquidtight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch.
- B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with O-ring.

2.05 RIGID NONMETALLIC CONDUIT AND FITTINGS

- A. Conduit: NEMA TC-2; Schedule 40 PVC. Schedule 80 may be used only in chemical areas in lieu of PVC jacketed rigid metal conduit.
- B. Fittings and Conduit Bodies: NEMA TC-3.

2.06 FLEXIBLE CONDUIT BODIES

- A. Flexible conduit bodies shall be installed across construction for expansion joints per structural Contract Drawings.

PART 3 - EXECUTION

3.01 CONDUIT

- A. Except as noted, use only PVC coated galvanized rigid steel conduits for exposed installations and PVC schedule 40 conduits for in-slab and underground installations.
- B. Use liquidtight flexible conduit for connections to motors, transformers, and other vibrating equipment located in non-hazardous areas. Explosion-proof couplings shall be used in hazardous areas.
- C. Non-jacketed flexible steel conduit may be used for connections to lighting fixtures in suspended ceilings.
- D. Use PVC coated rigid steel conduits where conduits are in direct contact with earth.
- E. Where PVC conduit is indicated, make a transition to PVC coated galvanized rigid steel conduit below grade or slab.

Exception: PVC conduit may enter the bottom of switchboards, motor control centers or other floor standing electrical equipment enclosures in non-hazardous areas.

3.02 CONDUIT ARRANGEMENT AND SUPPORT

- A. Arrange conduit to maintain headroom and present a neat appearance. Run exposed conduits parallel or perpendicular to building surfaces and adjacent piping. Group conduit in parallel runs where practical and provide rack space for 25% additional conduits. Use concentric bends for parallel runs.
- B. Avoid sources of heat when possible. Where unavoidable, maintain 3-inch clearance when crossing hot pipes and 12-inch clearance between parallel hot pipes, flues, heating appliances, and other heat sources.
- C. Support conduits to prevent distortion of alignment by wire pulling operations. Fasten single conduits with one-hole malleable iron straps. For horizontal runs, hole in strap shall be below the conduit. For multiple runs use galvanized steel channel and clamps. Wire, perforated pipe straps and the like are not acceptable support means.

- D. Support conduit at a maximum of 7-feet on center and within 3-feet of each box, cabinet, or fitting. Hang trapeze assemblies with threaded rods not less than 3/8-inch diameter. Remove all temporary supports prior to pulling conductors.

3.03 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipecutter and de-burr cut ends. Paint threads with zinc compound. Bring conduit to the shoulder of fittings and couplings and fasten securely. All connections are to be wrench tightened and electrically continuous. No running threads are permitted.
- B. Use conduit hubs for fastening conduit to cast boxes. Use conduit bodies to make sharp changes in direction. For sizes 2-inches and larger, use "LBD" or similar fittings to permit a straight pull from either direction.
- C. The maximum length between pull points is 400-feet. This length shall be reduced by 1-foot for each degree of bend.
- D. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size. Crushed or deformed conduits may not be installed.
- E. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- F. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture. Install threaded PVC end caps on conduits stubbed up for future use.
- G. Provide a 200-pound tensile strength polyolefin line pulled through and tied off at each end of all empty conduits.
- H. Install flexible couplings or expansion joints where conduit crosses building expansions joints and for straight runs in excess of 100-feet.
- I. Where conduit penetrates fire-rated walls and floors, provide mechanical fire-stop fittings with UL listed fire rating equal to wall or floor rating.
- J. Provide watertight seals, equal to OZ type WSK or FSK, where conduit penetrates exterior walls and where conduit passes between spaces normally at different temperatures. Seal off conduits with silicone compound to prevent moisture from entering building and/or equipment where conduits penetrate walls below grade.
- K. In locations where the conduit cannot be turned, provide three piece threaded rigid couplings. Provide clamp backs for conduits on exterior or damp surfaces to prevent the raceway from bearing directly on the damp surface.
- L. Route conduits in slabs above the bottom reinforcing and below the top reinforcing. Maximum size for conduits in slabs above grade is 1-inch. Route so conduits in slabs above grade do not cross.

- M. PVC conduit bends: Do not use methods which will deform or change the physical characteristics of the conduit. Use PVC-coated rigid steel factory elbows, regardless of length.
- N. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.
- O. PVC coated conduit: Exercise care not to damage the coating during cutting, threading, bending, and assembly. Follow the manufacturer's installation instructions. Use vise jaws, bending equipment, strap wrenches, and other tools which are specifically designed for coated conduits. Do not use chain vise, pipe wrench, channel locks or the like.

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SECTION 26 05 43

UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings, including GRC conduit.
2. Rigid nonmetallic duct.
3. Flexible nonmetallic duct.
4. Duct accessories.
5. Precast concrete handholes.
6. Polymer concrete handholes and boxes with polymer concrete cover.
7. Fiberglass handholes and boxes with polymer concrete cover.
8. Fiberglass handholes and boxes.
9. High density plastic boxes.

1.2 DEFINITIONS

- A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
- B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
- C. Duct Bank:
 1. Two or more ducts installed in parallel, with or without additional casing materials.
 2. Multiple duct banks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 1. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

- a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
- b. Include duct entry provisions, including locations and duct sizes.
- c. Include cover design.
- d. Include grounding details.
- e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 INFORMATIONAL SUBMITTALS

- A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures. Drawings shall be signed and sealed by a qualified professional engineer.
- B. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.
- C. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.
- D. Source quality-control reports.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

PART 2 PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

- A. GRC: Comply with ANSI C80.1 and UL 6.
- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 RIGID NONMETALLIC DUCT

- A. Underground Plastic Utilities Duct: Type EPC-40-PVC RNC, complying with NEMA TC 2 and UL 651, with matching fittings complying with NEMA TC 3 by same manufacturer as duct.

- B. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.
- C. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 DUCT ACCESSORIES

- A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.
- B. Underground-Line Warning Tape: Comply with requirements for underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

2.4 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

- A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.
- B. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
- C. Color: Gray.
- D. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
- E. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
- F. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
- G. Cover Legend: Molded lettering, "ELECTRIC"
- H. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
- I. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
- J. Handholes 24 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.5 SOURCE QUALITY CONTROL

- A. Test and inspect precast concrete utility structures according to ASTM C 1037.

- B. Nonconcrete Handhole and Pull-Box Prototype Test: Test prototypes of and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 - 1. Tests of materials shall be performed by an independent testing agency.
 - 2. Strength tests of complete boxes and covers shall be by an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 - 3. Testing machine pressure gages shall have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 EXECUTION

3.1 PREPARATION

- A. Coordinate layout and installation of duct, duct bank, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field. Notify Architect if there is a conflict between areas of excavation and existing structures or archaeological sites to remain.
- B. Coordinate elevations of duct and duct-bank entrances into handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to handholes, and as approved by Architect.

3.2 UNDERGROUND DUCT APPLICATION

- A. Duct for Electrical Feeders 600 V and Less: RNC Type EPC-40-PVC, direct-buried unless otherwise indicated.
- B. Duct for Electrical Branch Circuits: RNC Type EPC-40-PVC, direct-buried unless otherwise indicated.
- C. Underground Ducts Crossing Paved Paths, Driveways and Roadways: RNC Type EPC-40 PVC, encased in reinforced concrete.

3.3 UNDERGROUND ENCLOSURE APPLICATION

- A. Handholes and Boxes for 600 V and Less:
 - 1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.

2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer concrete units, SCTE 77, Tier 8 structural load rating.
4. Cover design load shall not exceed the design load of the handhole or box.

3.4 EARTHWORK

- A. Excavation and Backfill: Comply with Section 31 23 16 "Excavation," but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete.
- C. Restore surface features at areas disturbed by excavation and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.
- D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
- E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures.

3.5 DUCT AND DUCT-BANK INSTALLATION

- A. Where indicated on Drawings, install duct, spacers, and accessories into the duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
- B. Install duct according to NEMA TCB 2.
- C. Slope: Pitch duct a minimum slope of 1:300 down toward handholes and away from buildings and equipment. Slope duct from a high point between two handholes, to drain in both directions.
- D. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations unless otherwise indicated.
 1. Duct shall have maximum of two 90 degree bends or the total of all bends shall be no more 180 degrees between pull points.

- E. Joints: Use solvent-cemented joints in duct and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent duct do not lie in same plane.
- F. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing the duct will not be subject to environmental temperatures above 40 deg C. Where environmental temperatures are calculated to rise above 40 deg C, and anywhere the duct crosses above an underground steam line, install insulation blankets listed for direct burial to isolate the duct bank from the steam line.
- G. End Bell Entrances to Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch duct, and vary proportionately for other duct sizes.
- H. Terminator Entrances to Polymer Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inches o.c. for 4-inch duct, and vary proportionately for other duct sizes.
- I. Building Wall Penetrations: Make a transition from underground duct to GRC at least 10 feet outside the building wall, without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for RNC-to-GRC transition. Install GRC penetrations of building walls.
- J. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- K. Pulling Cord: Install 200-lbf-test nylon cord in empty ducts.
- L. Direct-Buried Duct and Duct Bank:
 - 1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inches in nominal diameter.
 - 2. Width: Excavate trench 12 inches wider than duct on each side.
 - 3. Width: Excavate trench 3 inches wider than duct on each side.
 - 4. Depth: Install top of duct at least 36 inches below finished grade unless otherwise indicated.
 - 5. Set elevation of bottom of duct bank below frost line.
 - 6. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
 - 7. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 feet of duct. Place spacers within 24 inches of duct ends. Stagger spacers approximately 6 inches

between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

8. Install duct with a minimum of 3 inches between ducts for like services and 6 inches between power and communications duct.
9. Elbows: Install manufactured duct elbows for stub-ups, at building entrances, and at changes of direction in duct direction unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
10. Install manufactured GRC elbows for stub-ups, at building entrances, and at changes of direction in duct.
11. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.
 - a. Place minimum 3 inches of sand as a bed for duct. Place sand to a minimum of 6 inches above top level of duct.
 - b. Place minimum 6 inches of engineered fill above concrete encasement of duct.

M. Underground-Line Warning Tape: Bury magnetic underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inches above all duct banks and approximately 12 inches below grade. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of ductbank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.6 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

- C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch above finished grade.
- D. Install handholes and boxes with bottom below frost line.
- E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
- F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
- G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
 - 1. Concrete: 3000 psi, 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.
 - 2. Dimensions: 12 inches wide by 12 inches deep.

3.7 GROUNDING

- A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
 - 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch-long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
 - 3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding."
- B. Correct deficiencies and retest as specified above to demonstrate compliance.
- C. Prepare test and inspection reports.

3.9 CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

- B. Clean internal surfaces of handholes, including sump.
 - 1. Sweep floor, removing dirt and debris.
 - 2. Remove foreign material.

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SECTION 26 08 00

ACCEPTANCE TESTING AND CALIBRATION

PART 1 - GENERAL

1.01 SCOPE

- A. This Section includes a Thermographic survey and the field testing, inspection and adjusting of all material and equipment installed. Other Electrical Sections covering individual types of equipment may have additional testing requirements.
- B. The purpose of these specifications is to assure that all tested electrical equipment and systems are operational and within applicable standards and manufacturer's tolerances and that the equipment and systems are installed in accordance with design specifications.

1.02 REFERENCES

- A. Publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designations only.
 - 1. International Electrical Testing Association (NETA).
 - a. NETA – Acceptance Testing Specification.
 - 2. National Fire Protection Association (NFPA).
 - a. NFPA 70 – National Electrical Code.

1.03 QUALITY CRITERIA

- A. All field testing shall conform to the latest edition of "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" as published by the International Electrical Testing Association (NETA) and shall be performed by an independent testing firm certified by NETA.
- B. Items not passing test will be rejected and shall be repaired or replaced with acceptable new items.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

- A. Inspect, test and calibrate in accord with manufacturer's instructions supplemented by this Specification.

- B. Institute and maintain rigorous precautions for all test procedures requiring application of potentials above 30 volts, erect barricades around danger areas, post suitable warning signs and station watchman as necessary to ensure that unauthorized persons do not approach energized conductors. Maintain telephone or voice radio contact between potential source location and energized remote locations during any potential testing operations.

3.02 POWER CIRCUIT BREAKERS

- A. Preparatory Work: Prior to testing, remove each breaker from its compartment. Clean, lubricate, inspect and adjust each breaker in accord with manufacturer's published maintenance instructions. Inspect contacts, arc quenchers, primary and secondary disconnects, current sensors, small wiring and trip devices. Examine contacts for condition, clearance, pressure and wipe.
- B. Tests and data: Determine and record the following data:
 - 1. Breaker identification, including Owner's designation, manufacturer's ratings, serial number, trip device type, ranges and time bands.
 - 2. Test each breaker electrically for proper tripping characteristics by passing 60 Hz. sinusoidal low voltage current through each pole, one at a time, with test current injection at the primary disconnects. Adjust trip devices for required pickup characteristics. Perform tests at operating trip device settings as specified. Include this information in the report plus the record of the settings "as left" after calibration.
 - 3. Apply sufficient current to actuate each mode of trip device, i.e., long time pickup, long time delay band, short time pickup, short time delay band, instantaneous pickup, ground pickup and ground delay band as applicable. Test current and elapsed time at tripping. For each pole, state whether or not breaker tripping is within the manufacturer's tolerances.
 - 4. Perform insulation resistance test on each breaker. With contacts closed, apply 1000 volts DC and make readings after one minute energization between each pair of poles and from each pole to the breaker frame.
- C. Molded Case Circuit Breakers and Motor Circuit Protectors (MCP). Test automatic molded case circuit breakers for acceptance prior to installation in circuit. Quantity to be tested is indicated below.
 - 1. Thermal Magnetic Trips. (Breakers Only). Test breakers having thermal magnetic trips in a temperature controlled environment maintained at 40°C plus or minus 3°C. A temperature stabilization period of 15 minutes is required prior to testing the inverse-time automatic tripping characteristics. Test each pole of each breaker at 90% and 200% of its continuous current rating. Replace any breaker or trip device which trips within 10 minutes at 90%, or which fails to trip at 200% within the time indicated in the following table:

Rated Continuous Current, Amperes	Max. Tripping Time, Minutes	Breakers Tested per Panel or Switchboard
15 - 40	2	10% (NOT LESS THAN 2)
50	4	20% (NOT LESS THAN 1)
60 - 100	6	50% (NOT LESS THAN 1)
125 - 225	8	100%
250 - 400	10	100%
500 - 600	12	100%
700 - 800	14	100%
1000	16	100%
1200	18	100%

2. Instantaneous Trips. Test each pole of each breaker and motor circuit protector for automatic instantaneous tripping with slowly rising current. Replace any breaker or trip device which fails to operate within the following values:
 - a. Non Adjustable Trips - plus or minus 20% of fixed setting.
 - b. Adjustable Trips - plus or minus 10% of the high setting of the rms values of the instantaneous tripping current.
3. Motor Circuit Protectors after testing shall be placed in service at the minimum position which permits motor starting based on motor nameplate data following MCP manufacturer's instructions.

3.03 MOTORS AND MOTOR CONTROLS

- A. Inspect and test motors and motor wiring, power and control for proper connection, circuit continuity, wire identification, insulation resistance and proper functioning or operation. Test insulation resistance from line to line and from each line to ground with a test instrument. Make tests prior to energizing circuits. Test motors for correct rotation. Test proper operation of starters and control devices. Record the nameplate data of motors for the selection of the proper overload relay heater size. Overload relay heaters furnished with equipment shall not be considered correct by virtue of the fact that heaters were so furnished and installed.
- B. Test and inspect power distribution equipment for damage, defects and for proper functioning of all electrical and mechanical components. Test line and load bus, connections and conductors for test circuit breakers for proper electrical and mechanical operation.
- C. Place motor circuit protectors in service at the minimum position which permits motor starting, based on motor nameplate data and following MCP manufacturer's instructions.

3.04 SPECIAL SYSTEMS

- A. Exercise care in the testing of electrical systems so as not to damage special, electronic or instrumented circuits. Do not undertake to check or test special electronic or instrumented circuits beyond the manufacturer's instructions included with the equipment and performed for equipment installation. Test the continuity only for alarm, instrumentation, or similar special wiring systems prior to the final equipment connections.

3.05 INSULATION TESTS

- A. Furnish the necessary test equipment and labor to test the insulation of electrical equipment and circuits before they are energized. Use a 500 volt "Megger" or other approved instrument, to test the insulation resistance of circuits insulated for 600 volts, associated motors and transformers, low-voltage motor control centers and low voltage switchboard.

- B. Insulation Tests: Include, but are not limited to, the following:

1. Transformers: Test primary to ground, secondary to ground and primary to secondary.
2. Services: Test phase to phase and each phase to ground.
3. Cables: Test phase to phase and each phase to ground.
4. Motors: Test winding to ground.
5. Load Side of 600 Volt Circuits: Test each phase to ground and phase to phase.
6. Minimum Acceptable Megger Readings (Megohms at 20 C) for 600 volt class equipment:

a. Transformers	Megohms
b. Primary to ground	20
c. Primary to Secondary	20
d. Secondary to Ground	5
e. Services - Motor Starters and Buses	20
f. Motors	1
g. Load side of 600 volt circuits less motor	20

- C. Control power transformers, potential transformers and other devices connected phase to phase or phase to ground and any devices not designed to withstand the test voltages must be disconnected when testing insulation resistance in switchboard, motor control centers and other apparatus.

- D. Keep written record of tests performed on forms approved for the purpose and turned over to Owner upon request, or at the termination of the Work. Identify each circuit or piece of apparatus tested, the date of the test, the temperature at the time of testing, the

instrument used, the test voltage applied, the resistance values found and the name of the person in charge of and witnessing the test.

3.06 THERMOGRAPHIC SURVEY

A. Visual and Mechanical Inspection

1. Inspect physical, electrical, and mechanical condition.
2. Remove all necessary covers prior to thermographic inspection. Utilize appropriate caution, safety devices, and personal protective equipment.

B. Equipment to be inspected shall include all current-carrying devices.

C. Provide report including the following:

1. Description of equipment to be tested.
2. Discrepancies.
3. Temperature difference between the area of concern and the reference area.
4. Probable cause of temperature difference.
5. Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.
6. Identify load conditions at time of inspection.
7. Recommended action.

D. Test Parameters

1. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1°C at 30°C.
2. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
3. Thermographic surveys should be performed during periods of maximum possible loading but not less than 40% of rated load of the electrical equipment being inspected. Refer to NFPA 70B, Section 18-16 (Infrared Inspection).

E. Test Values

1. Suggested actions based on temperature rise can be found in Table 10.18 of NETA Acceptance Testing specifications.

3.07 FINAL INSPECTION AND TEST

- #### A. Upon completion of the various phases of the project, or at convenient times during progress of the Work, check and/or test as herein specified all equipment and wire installed.

- B. Under no circumstances shall any part of the installation be operated by construction personnel without prior written approval of the Engineer. This restriction includes the checking of electrical motors for rotation.
- C. Upon receipt of written notice that the work has been completed, including tests herein specified, Engineer will give the entire Work a thorough inspection. Any defects or omissions noted shall be corrected before acceptance of the work.
- D. The inspections and tests to be made shall include, but are not limited to, the following:
 - 1. Visually inspect wires and cable connections including internal wiring of switchgear, transformers and other equipment.
 - 2. Verify continuity of power and control conductors.
 - 3. Make insulation tests as herein specified.
 - 4. Check control circuits for short circuits and extraneous grounds.
 - 5. Check equipment for proper mechanical adjustment and freedom of operation and removal of shipping blocks and/or stops.
 - 6. Check closing, tripping, supervision, and alarm functions of the controlled equipment.
 - 7. Operate motor controllers, contactors, etc., from their control devices.
 - 8. Check operation of alarm circuits.
 - 9. Check motors for proper rotation and motor currents measured under load conditions. Any motor found to be operating incorrectly shall be inspected to determine the cause and the condition shall be corrected to the satisfaction of the Engineer. Furnish a record of these tests to the Engineer.

- END OF SECTION -

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing labor, materials, and equipment, tools, and incidentals for complete and operable panelboards.

1.02 RELATED SECTIONS INCLUDE BUT ARE NOT LIMITED TO:

- 1. Section 01 33 00 – Submittals.
- 2. Section 26 00 00 – General Electrical Requirements.

1.03 REFERENCES

- A. Publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designations only.
 - 1. National Electrical Manufacturers Association (NEMA).
 - a. NEMA PB-1 – Panelboards.
 - b. NEMA AB-1 – Molded-Case Circuit Breakers, Molded Case Switches and Circuit-Breaker Enclosures.
 - 2. Underwriters laboratories Inc. (UL).
 - a. UL67 – Panelboards.

1.04 SUBMITTALS

- A. Submit shop drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Eaton.
- B. Schneider Electric / Square D.
- C. ABB / GE.
- D. Siemens.
- E. Or approved equal.

2.02 PANELBOARDS

- A. Panelboards: NEMA PB 1; UL 67.
- B. Rating: Voltage and ampere ratings are shown on the Drawings. Unless otherwise indicated interrupting ratings (RMS symmetrical) are 65,000 amps for 480/277 volt panelboards and 14,000 amps for 240 and 208 volt panelboards.
- C. Boxes: Code gage galvanized steel; sized to accommodate devices indicated and afford wire bending space in accordance with NEC requirements.
- D. Fronts: Surface or flush as indicated, door in door construction, finished in light grey enamel over a rust inhibitor. Furnish flush lock for fronts less than 48-inches high and vault type handle with three point catch for fronts 48-inches and higher.
- E. Bus: Copper, arranged for breakers. Furnish insulated neutral bus and ground bus with main lug bonded to the box.
- F. Circuit Breakers: NEMA AB 1; molded case type, thermal magnetic trip with internal common trip on multiple breakers. Provide breaker fully rated for interrupting ratings noted; series ratings are not acceptable. Breakers shall be of the bolt-on type. Circuit breakers in panelboards shall be rated for 50 degree C environment. Breakers shall be finger safe type.
- G. Provide engraved nameplates giving the voltage rating and panel designation as indicated. Provide a UL service entrance label for panelboards used as service entrance equipment.
- H. Two section panels: Box and front same height each section.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install boxes so they are rigidly supported and correctly aligned. Select mounting height so that operating handles are not higher than 6-feet 6-inches nor lower than 24-inches above the floor.
- B. Prior to energizing panelboards clean out construction dirt and debris. Paint any scratches on the trims or dead front barriers. Meggar each phase to phase and ground to ensure that no short circuits exist.
- C. Adjust panel barriers so that no openings occur between them and the panel front. Provide filler plates and plugs as necessary to maintain dead front integrity.
- D. Type directory cards with circuit loads and/or area served. Note spare circuits in pencil.

3.02 FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20%, rearrange circuits in the panelboard to balance the phase loads within 20%. Take care to maintain proper phasing for multi-wire branch circuits.

- END OF SECTION -

SECTION 31 11 00

SITE PREPARATION

PART 1 – GENERAL

1.1 DEFINITIONS

- A. The terms "Clearing" and "Grubbing" used in these specifications will be as defined in the Georgia Department of Transportation Specifications, Latest Edition, Section 201.1.01.

1.2 WORK INCLUDED

- A. Furnish all labor, equipment and materials as required to prepare the construction site for the required work as shown on the drawings or as specified herein. Site preparation required for this project includes, but is not necessarily limited to:
 - 1. Observation of clearing limits - clearing at construction sites shall be limited to the disturbed area as shown on the Drawings.
 - 2. Contractor shall be extremely careful while working within the Wyckoff Water Treatment Plant and observe strict safety procedures and practices. There is limited Ingress/ Egress access to these areas, and careful, prudent practices shall be observed at all times.

1.3 QUALITY ASSURANCE

- A. The Contractor, in conducting the work required on this project, is to cause no damage to property, soils or vegetation outside the limits of construction defined in this and other sections of these Specifications, as shown on the Drawings, or required by the Engineer. Any damage to property soil or vegetation outside the limits of construction shall be repaired immediately, by the Contractor, as defined herein at no additional cost to the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 WORKMANSHIP

- A. Clear and grub all trees, shrubs, and ground vegetation from the site as necessary to construct the proposed structures and install the proposed water main. These cleared materials shall be removed from the site.
- B. Those areas that are cleared beyond specified limits shall be restored to their original state at the expense of the Contractor. Trees damaged during construction shall be replaced by the Contractor; or at the Engineer's discretion, trees that are damaged during construction may have any wounds dressed and coated with an approved pruning paint.

3.2 ENVIRONMENTAL PROTECTION

- A. Defined in Section 31 25 00.
- B. During construction the Contractor shall provide preventive measures as may be required by governing laws or ordinances to prevent siltation and soil erosion.

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SECTION 31 23 13

SUBGRADE PREPARATION

PART 1 – GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. ASTM International (ASTM):
 - a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
 - b. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).

1.02 DEFINITIONS

- A. Optimum Moisture Content: As defined in Section 31 23 23, Fill and Backfill.
- B. Prepared Ground Surface: Ground surface after completion of clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and scarification and compaction of subgrade.
- C. Relative Compaction: As defined in Section 31 23 23, Fill and Backfill.
- D. Relative Density: As defined in Section 31 23 23, Fill and Backfill.
- E. Subgrade: Layer of existing soil after completion of clearing, grubbing, scalping of topsoil prior to placement of fill, roadway structure or base for floor slab.
- F. Proof-Rolling: Testing of subgrade by compactive effort to identify areas that will not support the future loading without excessive settlement.

1.03 SEQUENCING AND SCHEDULING

- A. Complete applicable Work specified in Sections 02 41 13, Demolition; and 31 23 16, Excavation, prior to subgrade preparation.

1.04 QUALITY ASSURANCE

- A. Notify Engineer when subgrade is ready for compaction or proof-rolling or whenever compaction or proof-rolling is resumed after a period of extended inactivity.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Prepare subgrade when unfrozen and free of ice and snow.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

- A. Keep subgrade free of water, debris, and foreign matter during compaction or proof-rolling.
- B. Bring subgrade to proper grade and cross-section and uniformly compact surface.
- C. Do not use sections of prepared ground surface as haul roads. Protect prepared subgrade from traffic.
- D. Maintain prepared ground surface in finished condition until next course is placed.

3.02 COMPACTION

- A. Under Earthfill: Compact upper 12 inches to minimum of 95 percent of the soils maximum dry density as determined in accordance with ASTM D698.
- B. Under Pavement Structure, Floor Slabs on Grade, or Granular Fill Under Structures: Compact the upper 12 inches to minimum of 98 percent the soils maximum dry density as determined in accordance with ASTM D698.

3.03 MOISTURE CONDITIONING

- A. Dry Subgrade: Add water, then mix to make moisture content uniform throughout.
- B. Wet Subgrade: Aerate material by blading, discing, harrowing, or other methods, to hasten drying process.

3.04 TESTING

- A. Proof-roll subgrade with equipment specified in Article Compaction to detect soft or loose subgrade or unsuitable material, as determined by Engineer.

3.05 CORRECTION

- A. Soft or Loose Subgrade:
 - 1. Adjust moisture content and recompact, or
 - 2. Over excavate as specified in Section 31 23 16, Excavation, and replace with suitable material from the excavation, as specified in Section 31 23 23, Fill and Backfill.
- B. Unsuitable Material: Over excavate as specified in Section 31 23 16, Excavation, and replace with suitable material from the excavation, as specified in Section 31 23 23, Fill and Backfill.

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SECTION 31 23 16

EXCAVATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section includes furnishing all labor, materials, and equipment required for all excavation and fill operations including, but not limited to, clearing and grubbing the construction site; dewatering; excavating all classes of material encountered on the construction site; handling, storage, transportation, and disposal of all excavated and unsuitable material; handling, storage, and transportation of all off-site borrow excavation; construction of fills and embankments; backfilling around structures and pipe; backfilling all trenches and pits; compacting; sheeting, shoring and bracing; preparation of subgrades; surfacing and grading, and all other appurtenant earthwork operations which may be necessary to complete the work as specified herein and as shown on the drawings.

1.02 GENERAL

- A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.
- B. The elevations shown on the Drawings as existing are intended to give reasonable, accurate information about the relative elevations. They are not precise, and the Contractor should satisfy himself as to the exact quantities of excavation and fill required.
- C. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.
- D. All excavated and filled areas shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.
- E. Earthwork within the right-of-way of the State Department of Transportation, the County Department of Transportation, and the respective cities shall be done in accordance with requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these specifications.
- F. The Contractor shall control grading in a manner to prevent water running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Free access must be provided to all fire hydrants, water valves, and meters.
- G. The Contractor will conduct tests for compaction and density via an independent testing laboratory. The costs of compaction tests performed by an independent testing laboratory will be paid by the Contractor and reimbursed, for passing tests, under the cash allowance for testing. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting

compaction and density tests. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor.

- H. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations.

PART 2 - PRODUCTS

2.01 STABILIZATION STONE

- A. No. 57 angular graded crushed stone, 1-inch to 3/16-inches (No. 4) in size with no more than 5 percent passing a No. 8 standard sieve in accordance with ASTM D448.
- B. Free from dirt, clay balls and organic material

2.02 SELECT EARTH BACKFILL

- A. Excavated SM and ML material that is free from rocks larger than 1-inch in diameter, ashes, cinders, refuse, organic material, frozen soil, and other deleterious material.
- B. Material containing more than 10 percent gravel, stones, or shale particles is not acceptable.
- C. Backfill material shall be within ± 3 percent of its optimum moisture content.
- D. Provide imported material as required to accomplish work.

2.03 COMMON EARTH BACKFILL

- A. Excavated SM and ML material that is free from rocks larger than 3-inches in diameter, ashes, cinders, refuse, organic material, frozen soil, and other deleterious material.
- B. Material containing more than 10 percent gravel, stones, or shale particles is not acceptable.
- C. Backfill material shall be within ± 3 percent of its optimum moisture content.
- D. Provide imported material as required to accomplish work.

2.04 TOP SOIL

- A. The top 6-inches of soil that is suitable for use in seeding and planting.
- B. Free from roots, refuse and any material toxic to plant growth.

PART 3 - EXECUTION

3.01 GENERAL

- A. Protect all existing utilities (pipes, structures, cables, etc.). Repair all utilities that are damaged by the Contractor, or utilities damaged as a result of Contractor negligence, at no additional cost to the Owner.

3.02 INITIAL ACTIVITIES

- A. Notify Utility Protection Center a minimum of 3 days prior to beginning any land disturbing activities.

- B. Install all erosion and sediment control devices prior to beginning any land disturbing activities.

3.03 CLEARING AND GRUBBING

- A. Protect all trees, ornamental plantings, and structures within or adjacent to the clearing limits that are shown or specified to not be removed with tree protection fence.
- B. Remove all vegetation, brush, stumps, roots, debris, and any other objectionable matter.
- C. Properly dispose of all materials cleared and grubbed from the project offsite.

3.04 PAVEMENT REMOVAL

- A. When approved, remove pavement and road surfaces as required in order to excavate soil.
- B. Saw cut pavement with a rotary saw, making straight cuts along the outside edges of the excavation.
- C. Width of pavement removal for pipe trenches shall be 12-inches greater than the width of the trench on each side.
- D. Remove full width of driveways and sidewalks from control joint to control joint.
- E. Remove curb and gutter from control joint to control joint.
- F. Properly dispose of all materials offsite.

3.05 SHEETING, SHORING AND BRACING

- A. Contractor is responsible for trench safety and is responsible for assessing and analyzing the need for sheeting, shoring and bracing.
- B. Install sheeting, shoring and bracing in all open excavation in accordance with the requirements of Title 29 Code of Federal Regulations, Part 1926.650-652, Subpart P, OSHA's Rules and Regulations for Construction Employment.
- C. All excavations more than 5 feet deep must have a protective system in place while workers are present in the excavation.
- D. All excavations more than 4 feet deep must have a way to get in and out of the excavation, usually a ladder, for every 25 feet of horizontal travel.

3.06 DEWATERING

- A. Provide all labor, materials, and equipment required to remove and control water as required to accomplish work.
- B. Where running or standing water occurs in an excavation or where the soil in the bottom of an excavation displays a "quick" tendency, the water shall be removed by pumping.
- C. Excavation shall be kept free from water during installation operations by suitable means, such as well points, until materials have been installed and backfill placed and compacted to a sufficient height to prevent flotation.
- D. Properly dispose of water in a manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed work, or adjacent property. Contractor is responsible for any damage caused by the dewatering operation.

- E. Contractor is responsible for obtaining any required permits, required by regulatory agencies, for discharging water from dewatering operations.

3.07 SOIL EXCAVATION

- A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish work. Excavate to tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, topsoil, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.
- B. Do not over excavate without written authorization of Engineer.
- C. Stockpile top soil separately from other excavated material.
- D. Stockpile excavated soil in a manner that will not obstruct the work or endanger the workers or the public, obstruct sidewalks, driveways, roadways, or other structures.
- E. Do not place excavated soil against tree trunks.
- F. Remove and properly dispose of excavated soil that is unsuitable for backfill or exceeds the quantity required for fill or backfill offsite.

3.08 TRENCH EXCAVATION

- A. Excavate trenches to the required alignment, depth, and width required to install the pipe or structure.
- B. Conform to all federal, state, and local regulations for the protection of workers; Contractor is responsible for trench safety.
- C. Width of the trench shall be of sufficient width to install the pipe, accommodate compaction equipment, and make necessary inspections. When required, trenches shall be made wider to permit the placing of shoring.
- D. Trench bottom shall be constructed to provide a firm, stable, and uniform support for the full length of the pipe. Blocking shall not be used to change pipe grade or to intermittently support pipe across excavated sections.
- E. If unsuitable soil exists, the trench shall be over-excavated to remove the unsuitable soil and backfilled with stabilization stone. Engineer shall determine the depth of over excavation.
- F. Open trenches shall be limited to 300 feet in length and shall be backfilled at the end of each work day.
- G. Open trenches shall be barricaded or covered until they are completely backfilled.
- H. Excavated soil that is unsuitable or exceeds the quantity required for backfill shall be disposed of offsite.

3.09 TRENCH REPAIR

- A. Paved Areas
 1. For cuts in pavement, stop backfill 8" below the finished grade.
 2. Verify pavement cuts are straight and vertical without jagged edges. If damaged edges or jagged edges exist, cut new edges.
 3. Install asphalt in accordance with standard pavement detail.
 4. Apply bituminous tack coat at a rate of 0.07 gallons per square yard to the top surface of first course and edges of existing asphalt.

B. Non-Paved Areas

1. Terminate backfill a sufficient depth below finished grade to allow the installation of 4-inches of top soil plus the final cover (seed, sod, etc.)
2. Install 4-inches of top soil and compact to a minimum of 90 percent of the maximum dry density, as determined by ASTM D698.
3. Install grass in accordance with Section 32 92 00, Grassing and Mulching.

3.10 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

- A. All materials removed by excavation, which are suitable for the purpose, shall be used to the extent possible for backfilling pipe trenches, foundations, and footings and for making embankment fills or for such other purposes as may be shown on the Drawings. All materials not used for such purposes shall be considered as waste materials and the disposal thereof shall be made by the Contractor in a lawful manner and at a location where such materials can be lawfully disposed offsite. Materials that will be considered spoil shall not be stored on site, not even on a temporary basis.
- B. Unsuitable materials, consisting of wood, shot rock, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material shall be removed from the work site and disposed of by the Contractor in a lawful manner.
- C. No unsuitable or waste material shall be dumped on private property unless written permission is furnished by the owner of the property and unless a dumping permit is issued from the local jurisdiction.

3.11 FINAL GRADING

- A. After other earthwork operations have been completed, the sites of all structures, roads, and embankments shall be graded within the limits and to the elevations shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If the Contractor is able to obtain the required degree of evenness by means of mechanical equipment he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished to slopes shown on the Drawings.
- B. Unless otherwise specified or shown on the Drawings, all finished ground surfaces shall be graded and dressed to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions.

3.12 TOPSOIL

- A. All areas to be sprigged or planted with grass shall be prepared by grading to a smooth, even surface to a level 4 inches below the elevation of the finished grade shown on the Drawings. It shall then be brought to a neat and finished grade by the addition of 4 inches of approved topsoil.
- B. Topsoil removed from the construction area may be stockpiled and reused or topsoil may be obtained from approved borrow areas. If obtained from borrow areas, the Contractor shall make suitable arrangements with the property owner and shall pay all costs incident to the borrowed material including royalties.

3.13 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within one year after final acceptance of the work by the Owner.
- B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

- END OF SECTION -

SECTION 31 23 19

CONSTRUCTION DEWATERING

PART 1 – GENERAL

1.1 SCOPE

- A. The Contractor shall be responsible for controlling groundwater in a manner that will preserve the strength of the bedding soils, will not cause instability of the excavation slopes, will not result in damage to existing structures and will not allow ground water or siltation to enter the water main or structures while under construction.
- B. Where permeable soils are encountered at subgrade elevations, the Contractor shall maintain the groundwater level a minimum of 3' below the bottom of the trench.
- C. Open pumping from sumps and ditches, if it results in boils, loss of fines, softening of the ground, or instability of slopes, will not be permitted.
- D. The Contractor shall submit for the Engineer's approval a construction dewatering plan. The plan shall indicate the method of dewatering to be used, the location of any wells or pumps, and where pumped groundwater is to be discharged. No excavation will be allowed without an approved dewatering plan.

PART 2 – PRODUCT

2.1 EQUIPMENT

- A. Equipment used for dewatering is optional to the Contractor.
- B. Mechanical equipment used shall be in good working order and suitable for use under the anticipated conditions.
- C. Wells and well points, if used, shall be installed with suitable screens and filters so that continuous pumping of fines does not occur.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall maintain and operate his dewatering equipment until the structures are complete and the water main is installed in areas where ground water is present.
- B. No compensation for removal of unstable material below the subgrade shall be allowed if, in the opinion of the Engineer, modified dewatering techniques would solve the problem and result in a suitable subgrade.
- C. Dewatering discharge shall be accessible for collection of samples by the Engineer or testing company.
- D. Dewatering water shall be disposed of in accordance with applicable US Environmental Protection Agency, US Army Corps of Engineers, Georgia Environmental Protection Division standards and permits, and County and City ordinances.

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SECTION 31 23 23

FILL AND BACKFILL

PART 1 – GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. C117, Standard Test Method for Materials Finer Than 75-Micrometers (No. 200) Sieve in Mineral Aggregates by Washing.
 - b. C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - c. D75, Standard Practice for Sampling Aggregates.
 - d. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³).
 - e. D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - f. D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³).
 - g. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - h. D4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - i. D6938, Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.02 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by Engineer.

B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Relative Density: Calculated in accordance with ASTM D4254 based on maximum index density determined in accordance with ASTM D4253 and minimum index density determined in accordance with ASTM D4254.

- D. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.
- E. Completed Course: A course or layer that is ready for next layer or next phase of Work.
- F. Lift: Loose (uncompacted) layer of material.
- G. Geosynthetics: Geotextiles, geogrids, or geomembranes.
- H. Well-Graded:
 - 1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
 - 2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
 - 3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.
- I. Influence Area: Area within planes sloped downward and outward at 60-degree angle from horizontal measured from:
 - 1. 1 foot outside outermost edge at base of foundations or slabs.
 - 2. 1 foot outside outermost edge at surface of roadways or shoulder.
 - 3. 0.5 foot outside exterior at spring line of pipes or culverts.
- J. Borrow Material: Material from required excavations or from designated borrow areas on or near Site.
- K. Selected Backfill Material: Materials available onsite that Engineer determines to be suitable for specific use.
- L. Imported Material: Materials obtained from sources offsite, suitable for specified use.
- M. Structural Fill: Fill materials as required under structures, pavements, and other facilities.
- N. Embankment Material: Fill materials required to raise existing grade in areas other than under structures.

1.03 SUBMITTALS

- A. Action Submittals:
 - 1. Samples: Imported material taken at source.
- B. Informational Submittals:
 - 1. Manufacturer's data sheets for compaction equipment.

2. Certified test results from independent testing agency.

1.04 QUALITY ASSURANCE

A. Notify Engineer when:

1. Structure or tank is ready for backfilling, and whenever backfilling operations are resumed after a period of inactivity.
2. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
3. Fill material appears to be deviating from Specifications.

1.05 SEQUENCING AND SCHEDULING

- A. Complete applicable Work specified in Section 02 41 13, Demolition; Section 31 23 16, Excavation; and Section 31 23 13, Subgrade Preparation, prior to placing fill or backfill.
- B. Backfill against concrete structures only after concrete has attained compressive strength, specified in Section 03 30 00, Cast-in-Place Concrete. Obtain Engineer's acceptance of concrete work and attained strength prior to placing backfill.
- C. Backfill around water-holding structures only after completion of satisfactory leakage tests as specified in Section 03 30 00, Cast-in-Place Concrete.
- D. Do not place granular base, subbase, or surfacing until after subgrade has been prepared as specified in Section 31 23 13, Subgrade Preparation.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Gradation Tests:

1. As necessary to locate acceptable sources of imported material.
2. During production of imported material, test as follows:
 - a. Granular Fill: One test per source location
 - b. Sand: One test per source location
 - c. Base Course Rock: One test per source location
 - d. Foundation Stabilization Rock: One test per source location
 - e. Structural Fill: One test per source location
 - f. Graded Aggregate Base: One test per source location
 - g. Backfill Around Buried Structures: One test per source location
 - h. Granular Drain Material: One test per source location

2.02 EARTHFILL

- A. Excavated material from required excavations free from rocks larger than 3 inches, from roots and other organic matter, ashes, cinders, trash, debris, and other deleterious materials.

- B. Material containing more than 10 percent gravel, stones, or shale particles is unacceptable.
- C. Provide imported material of equivalent quality, if required to accomplish Work.

2.03 GRANULAR FILL

- A. 1½-inch minus crushed gravel or crushed rock (#57 stone).
- B. Free from dirt, clay balls, and organic material.
- C. Well-graded from coarse to fine and containing sufficient fines to bind material when compacted, but with maximum 8 percent by weight passing No. 200 sieve.

2.04 SAND

- A. Free from clay, organic matter, or other deleterious material.
- B. Gradation as determined in accordance with ASTM C117 and ASTM C136:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1/4-inch	100
No. 4	95 - 100
No. 200	0 - 8

2.05 WATER FOR MOISTURE CONDITIONING

- A. Free of hazardous or toxic contaminants, or contaminants deleterious to proper compaction.

2.06 BASE COURSE ROCK

- A. #57 stone or Graded Aggregate Base.

2.07 FOUNDATION STABILIZATION ROCK

- A. Crushed rock or pit run rock.
- B. Uniformly graded from coarse to fine.
- C. Free from excessive dirt and other organic material.
- D. Maximum 2-1/2-inch particle size (#357 stone).

2.08 SOIL COVER OVER GEOTEXTILES

- A. Particle Size: Maximum 1 inch.
- B. Free of sharp angular pieces that may damage geotextile.

PART 3 EXECUTION

3.01 GENERAL

- A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.
- B. Place and spread fill and backfill materials in horizontal lifts of uniform thickness, in a manner that avoids segregation, and compact each lift to specified densities prior to placing succeeding lifts. Slope lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.
- C. During filling and backfilling, keep level of fill and backfill around each structure and buried tank even.
- D. Do not place fill or backfill, if fill or backfill material is frozen, or if surface upon which fill or backfill is to be placed is frozen.
- E. If pipe, conduit, duct bank, or cable is to be laid within fill or backfill:
 - 1. Fill or backfill to an elevation 2 feet above top of item to be laid.
 - 2. Excavate trench for installation of item.
 - 3. Install bedding, if applicable, as specified in Section 31 23 16, Excavation, and other pertinent sections of these specifications.
 - 4. Install item.
 - 5. Backfill envelope zone and remaining trench before resuming filling or backfilling specified in this section.
- F. Tolerances:
 - 1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
 - 2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.
- G. Settlement: Correct and repair any subsequent damage to structures, pavements, curbs, slabs, piping, and other facilities, caused by settlement of fill or backfill material.

3.02 BACKFILL UNDER AND AROUND STRUCTURES

- A. Under Facilities: Within influence area beneath structures, slabs, pavements, curbs, piping, conduits, duct banks, and other facilities, backfill with granular fill, unless otherwise shown. Place granular fill in lifts of 6-inch maximum thickness and compact each lift to minimum of 98 percent of the maximum dry density, as determined in accordance with ASTM D698, at a moisture content within plus or minus 2 percent of optimum.
- B. Other Areas: Backfill with earthfill to lines and grades shown, with proper allowance for topsoil thickness where shown. Place in lifts of 6-inch maximum thickness and

compact each lift to minimum 95 percent of the maximum dry density as determined in accordance with ASTM D698.

3.03 FILL

- A. Outside Influence Areas beneath Structures, Tanks, Pavements, Curbs, Slabs, Piping, and Other Facilities: Unless otherwise shown, place earthfill as follows:
 - 1. Allow for 6-inch thickness of topsoil where required.
 - 2. Maximum 8-inch thick loose lifts.
 - 3. Place and compact fill across full width of embankment.
 - 4. Compact to minimum 95 percent of the maximum dry density as determined in accordance with ASTM D698.
 - 5. Dress completed embankment with allowance for topsoil, crest surfacing, and slope protection, where applicable.

3.04 SITE TESTING

- A. Gradation:
 - 1. One sample from each 1,500 tons of finished product or more often as determined by Engineer, if variation in gradation is occurring, or if material appears to depart from Specifications.
 - 2. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.
 - 3. Remove material placed in Work that does not meet Specification requirements.
- B. In-Place Density Tests: In accordance with ASTM 1556, Sand Cone Method or ASTM D6938, Nuclear Density Test.

3.05 SAND BLANKET OVER VAPOR RETARDER

- A. Place sand in manner that avoids damage to underlying vapor retarder.
- B. Moisten sand and thoroughly compact it with a vibratory plate compactor.

3.06 GRANULAR BASE, SUBBASE, AND SURFACING

- A. Place and Compact as specified in Section 32 11 23, Aggregate Base Courses.

3.07 REPLACING OVEREXCAVATED MATERIAL

- A. Replace excavation carried below grade lines shown or established by Engineer as follows:
 - 1. Beneath Footings: Granular fill.
 - 2. Beneath Fill or Backfill: Same material as specified for overlying fill or backfill.
 - 3. Beneath Slabs-On-Grade: Granular fill.
 - 4. Trenches:

- a. Unauthorized Overexcavation: Either trench stabilization material or granular pipe base material.
 - b. Authorized Overexcavation: Trench stabilization material.
5. Permanent Cut Slopes (Where Overlying Area is Not to Receive Fill or Backfill):
- a. Flat to Moderate Steep Slopes (3:1, Horizontal Run: Vertical Rise or Flatter): Earthfill.
 - b. Steep Slopes (Steeper than 3:1):
 - 1) Correct overexcavation by transitioning between overcut areas and designed slope adjoining areas, provided such cutting does not extend offsite or outside easements and right-of-ways, or adversely impacts existing facilities, adjacent property, or completed Work.
 - 2) Backfilling overexcavated areas is prohibited, unless in Engineer's opinion, backfill will remain stable, and overexcavated material is replaced as compacted earthfill.

3.08 ACCESS ROAD SURFACING

- A. Place and compact as specified in Section 32 12 16, Concrete Asphalt Paving.

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SECTION 31 32 00

SOIL STABILIZATION

PART 1 – GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. Official Seed Analysts of North America.

1.02 DEFINITIONS

A. Maintenance Period: Begin maintenance immediately after each area is planted and continue for a period of 8 weeks after planting under this section is completed.

B. Satisfactory Stand: Grass or section of grass that has:

1. No bare spots larger than 3 square feet.
2. Not more than 10 percent of total area with bare spots larger than 1 square foot.
3. Not more than 15 percent of total area with bare spots larger than 6 square inches.

1.03 SUBMITTALS

A. Action Submittals: Product data for commercial products; seed, fertilizer, and lime.

B. Informational Submittals:

1. Seed certifications.
2. Copies of delivery invoices or other proof of quantities of mulch, lime, and fertilizer.
3. Manufacturer's Installation Instructions: Commercial products.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Seed

1. Furnish in standard containers with seed name, lot number, net weight, percentage of purity, germination, and hard see and maximum weed seed content, clearly marked for each container of seed.
2. Keep dry during storage.

B. Hydroseeding Mulch: Mark package of wood fiber mulch to show air dry weight.

1.05 SEQUENCING AND SCHEDULING

A. Prepare topsoil before starting Work of this section.

- B. Complete soil preparation, seeding, liming, fertilizing, mulching, and matting within 10 days after final grades have been reached.
- C. Notify Engineer at least 3 days in advance of:
 - 1. Materials delivery.
 - 2. Start of planting/seeding activity.
- D. Seeding: Perform under favorable weather conditions during seasons that are normal for such Work as determined by accepted local practice.

1.06 MAINTENANCE

- A. Operations:
 - 1. Perform during maintenance period to include:
 - a. Watering: Keep seeded surface moist.
 - b. Washouts: Repair by filling with topsoil, fertilizing, seeding, and mulching.
 - c. Replace wherever and whenever washed or blown away.
 - d. Reseed unsatisfactory areas or portions thereof immediately at end of maintenance period if a satisfactory stand has not been produced.
 - e. Mowing: Mow to 2 inches after grass height reaches 3 inches, and mow to maintain grass height from exceeding 3-1/2 inches.

PART 2 – PRODUCTS

2.01 FERTILIZER

- A. Commercial, uniform in composition, free-flowing, suitable for application with equipment designed for that purpose.
- B. As specified on the “Vegetative Covers” schedule shown in the ESC plans.

2.02 SEED

- A. Fresh, clean new-crop seed that complies with tolerance for purity and germination established by Official Seed Analysts of North America.
- B. Mix:
 - 1. As specified on the “Vegetative Covers” schedule shown in the ESC plan.

2.03 MULCH

- A. Wood Cellulose Fiber Mulch:
 - 1. Specially processed wood fiber containing no growth or germination inhibiting factors.
 - 2. Dyed suitable color to facilitate inspection of material placement.

3. Manufactured such that after addition and agitation in slurry tanks with water, material fibers become uniformly suspended to form homogenous slurry.
4. When hydraulically sprayed on ground, material will allow absorption and percolation of moisture.

B. Straw:

1. Clean salt hay or threshed straw of oats, wheat, barley, or rye, free from seed of noxious weeds. Suitable for spreading with mulch blower equipment.
2. Average Stalk Length: 6 inches.
3. Seasoned before baling or loading.

2.04 EROSION CONTROL MATTING

A. Excelsior mat or straw blanket; staples as recommended by matting manufacturer.

B. Manufacturers and Products:

1. Akzo Industries, Asheville, NC; Curlex Mat.
2. North American Green, Evansville, IN; S150 blanket.

2.05 TACKIFIER

A. Derived from natural organic plant sources containing no growth or germination-inhibiting materials.

B. Capable of hydrating in water, and to readily blend with other slurry materials.

C. Wood Cellulose Fiber: Add as tracer, at rate of 150 pounds per acre.

D. Manufacturers and Products:

1. Chevron Asphalt Co.; CSS-1
2. Terra; Tack AR.
3. J-Tack; Reclamare

2.06 REINFORCED PLASTIC COVERING

A. Co-extruded, copolymer laminate reinforced with nonwoven grid of high strength nylon cord submersed in a permanently flexible adhesive media allowing for equal tear resistance in all directions.

B. Black in color and ultraviolet stabilized.

C. Physical Requirement (Minimum Average Roll Values):

1. Tear Strength: 130 pounds.
2. Elongation: 620 percent.

D. Manufacturers:

1. Reef Industries, Inc., Houston, TX.

2. Griffolyn Co., Houston, TX.

PART 3 – EXECUTION

3.01 SOIL PREPARATION

- A. Before start of hydroseeding, and after surface has been shaped and graded, and lightly compacted to uniform grade, scarify soil surface to minimum depth of 1 inch.

3.02 SEEDING

- A. Prepare 1-inch-deep seed bed; obtain Engineer's acceptance prior to proceeding.
- B. Apply by hydroseeding method on moist soil, but only after free surface water has drained away. Prevent drift and displacement of mixture into other areas.
- C. Prepare and apply seed mix and fertilizer as specified on the "Vegetative Covers" schedule shown in the ESC plans.
- D. Apply Wood Cellulose Fiber Mulch at 1,500 pounds per acre.
- E. Water as necessary.

3.03 MULCHING

- A. Apply uniformly on seeded areas. Do not apply mulch on seeded areas that will be immediately covered with erosion control matting.
- B. Application: Sufficiently loose to permit penetration of sunlight and air circulation, and sufficiently dense to shade ground, reduce evaporation rate, and prevent or materially reduce erosion of underlying soil.
 - 1. Straw: Apply by hand or mechanical means to minimum depth of 2 inches.
 - 2. Wood Cellulose Fiber: 1,000 to 1,500 pounds per acre.

3.04 EROSION CONTROL MATTING

- A. Place on seeded slopes 3H:1V and steeper, staple/stake in place and with the appropriate overlap in accordance with manufacturer's instruction.

3.05 TACKIFIER

- A. Apply on areas mulched with straw.
- B. Spray on after mulch is in place.
- C. Apply in quantities sufficient to equal retention properties of a CSS-1 asphalt emulsion being applied at rate of 400 gallons per acre.

3.06 REINFORCED PLASTIC COVERING

- A. Place on areas where hydroseeding and erosion control matting have not controlled erosion.
- B. Install in single thickness, strips parallel to direction of drainage.
- C. Maintain tightly in place by using sandbags on ropes with a maximum 10-foot grid spacing in all directions.
- D. Tape or weight down full length, overlap seams at least 12 inches.
- E. Remove at final acceptance, unless notified otherwise by Engineer.

3.07 FIELD QUALITY CONTROL

- A. Upon completion of maintenance period and on written notice from Contractor, Engineer will within 15 days of receipt, determine if a satisfactory stand has been established.
- B. If a satisfactory stand has not been established, Engineer will make another determination upon written notice from Contractor following the next growing season.

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SECTION 31 32 19.16

GEOTEXTILE

PART 1 – GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. ASTM International (ASTM):
 - a. D737, Standard Test Method for Air Permeability of Textile Fabrics.
 - b. D4355, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 - c. D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - d. D4533, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - e. D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - f. D4632, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - g. D4716, Test Method for Determining the (In-Plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - h. D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - i. D4833, Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 - j. D4884, Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles.
 - k. D4886, Standard Test Method for Abrasion Resistance of Geotextiles (Sand Paper/Sliding Block Method).
 - l. D5199, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
 - m. D5261, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
 - n. D6193, Standard Practice for Stitches and Seams.

1.02 DEFINITIONS

- A. Fabric: Geotextile, a permeable geosynthetic comprised solely of textiles.
- B. Maximum Average Roll Value (MaxARV): Maximum of series of average roll values representative of geotextile furnished.
- C. Minimum Average Roll Value (MinARV): Minimum of series of average roll values representative of geotextile furnished.

- D. Nondestructive Sample: Sample representative of finished Work, prepared for testing without destruction of Work.
- E. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.
- F. Seam Efficiency: Ratio of tensile strength across seam to strength of intact geotextile, when tested according to ASTM D4884.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. Manufacturer material specifications and product literature.
- b. Installation drawings showing geotextile sheet layout, location of seams, direction of overlap, and sewn seams.
- c. Description of proposed method of geotextile deployment, sewing equipment, sewing methods, and provisions for holding geotextile temporarily in place until permanently secured.

2. Samples:

- a. Geotextile: One-piece, minimum 18 inches long, taken across full width of roll of each type and weight of geotextile furnished for Project. Label each with brand name and furnish documentation of lot and roll number from which each Sample was obtained.
- b. Field Sewn Seam: 5-foot length of seam, 12 inches wide with seam along center, for each type and weight of geotextile.
- c. Securing Pin and Washer: One each.

B. Informational Submittals:

- 1. Certifications from each geotextile manufacturer that furnished products have specified property values. Certified property values shall be either minimum or maximum average roll values, as appropriate, for geotextiles furnished.
- 2. Field seam efficiency test results.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver each roll with sufficient information attached to identify it for inventory and quality control.
- B. Handle products in manner that maintains undamaged condition.
- C. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in way that protects it from elements. If stored outdoors, elevate and protect geotextile with waterproof cover.

1.05 SCHEDULING AND SEQUENCING

- A. Where geotextile is to be laid directly upon ground surface, prepare subgrade as specified in Section 31 23 13, Subgrade Preparation, first.
- B. Notify Engineer whenever geotextiles are to be placed. Do not place geotextile without Engineer's approval of underlying materials.

PART 2 – PRODUCTS

2.01 GEOTEXTILE

- A. Geotextile shall meet the requirements of AASHTO M288-96, Section 7.5, Permanent Erosion Control Recommendations.

2.02 SEWING THREAD

- A. Polypropylene, polyester, or Kevlar thread.
- B. Durability: Equal to or greater than durability of geotextile sewn.

2.03 SECURING PINS

- A. Steel Rods or Bars:
 - 1. 3/16-inch diameter.
 - 2. Pointed at one end.
 - 3. With head on other end sufficiently large to retain washer.
 - 4. Minimum Length: 12 inches.
- B. Steel Washers for Securing Pins:
 - 1. Outside Diameter: Not less than 1.5 inches.
 - 2. Inside Diameter: 1/4 inch.
 - 3. Thickness: 1/8 inch.

PART 3 – EXECUTION

3.01 LAYING GEOTEXTILE

- A. Lay and maintain geotextile smooth and free of tension, folds, wrinkles, or creases.

3.02 SHEET ORIENTATION ON SLOPES

- A. Orient geotextile with long dimension of each sheet parallel to direction of slope.
- B. Geotextile may be oriented with long dimension of sheet transverse to direction of slope only if sheet width, without unsewn seams, is sufficient to cover entire slope and anchor trench and to extend at least 18 inches beyond toe of slope.

3.03 JOINTS

A. Unseamed Joints:

1. Overlapped.
2. Overlap, unless otherwise shown:
 - a. Foundation/Subgrade Stabilization: Minimum 18 inches.
 - b. Riprap: Minimum 18 inches.
 - c. Drain Trenches: Minimum 18 inches, except overlap shall equal trench width if trench width is less than 18 inches.
 - d. Other Applications: Minimum 12 inches.

B. Sewn Seams: Made wherever stress transfer from one geotextile sheet to another is necessary. Sewn seams, as approved by Engineer, also may be used instead of overlap at joints for applications that do not require stress transfer.

1. Seam Efficiency:
 - a. Minimum 70 percent.
 - b. Verified by preparing and testing minimum of one set of nondestructive Samples per acre of each type and weight of geotextile installed.
 - c. Tested according to ASTM D4884.
2. Types:
 - a. Preferred: "J" type seams.
 - b. Acceptable: Flat or butterfly seams.
3. Stitch Count: Minimum three to maximum seven stitches per inch.
4. Stitch Type: Double-thread chainstitch according to ASTM D6193.
5. Sewing Machines: Capable of penetrating four layers of geotextile.
6. Stitch Location: 2 inches from geotextile sheet edges, or more, if necessary to develop required seam strength.

3.04 SECURING GEOTEXTILE

A. Secure geotextile during installation as necessary with sandbags or other means approved by Engineer.

B. Secure Geotextile with Securing Pins:

1. Insert securing pins with washers through geotextile.
2. Securing Pin Alignment:
 - a. Midway between edges of overlaps.
 - b. 6 inches from free edges.
3. Spacing of Securing Pins:

<u>Slope</u>	<u>Maximum Pin Spacing</u>
Steeper than 3:1	2 feet
3:1 to 4:1	3 feet
Flatter than 4:1	5 feet

4. Install additional pins across each geotextile sheet as necessary to prevent slippage of geotextile or to prevent wind from blowing geotextile out of position.
5. Push each securing pin through geotextile until washer bears against geotextile and secures it firmly to subgrade.

3.05 PLACING PRODUCTS OVER GEOTEXTILE

- A. Before placing material over geotextile, notify Engineer. Do not cover installed geotextile until after Engineer provides authorization to proceed.
- B. If tears, punctures, or other geotextile damage occurs during placement of overlying products, remove overlying products as necessary to expose damaged geotextile. Repair damage as specified in Article Repairing Geotextile.

3.06 INSTALLING GEOTEXTILE IN TRENCHES

- A. Place geotextile in a way to completely envelope granular drain material to be placed in trench and with specified overlap at joints. Overlap geotextile in direction of flow. Place geotextile in a way and with sufficient slack for geotextile to contact trench bottom and sides fully when trench is backfilled.
- B. After granular drain material is placed to required grade, fold geotextile over top of granular drain material, unless otherwise shown. Maintain overlap until overlying fill or backfill is placed.

3.07 RIPRAP APPLICATIONS

- A. Overlap geotextile at each joint with upstream sheet of geotextile overlapping downstream sheet.
- B. Sew joints where wave run-up may occur.
- C. Limit height of riprap fall onto geotextile to prevent damage.
 1. Drop Height: 0 foot for greater than 200-pound rock. 3 feet for less than 200-pound rock.

3.08 GEOTEXTILE-REINFORCED EARTH WALL APPLICATIONS

- A. Sew exposed joints; extend sewn seams minimum 3 feet behind face of wall.
- B. Protect exposed geotextile from damage, ultraviolet light exposure, and deterioration until permanent facing is applied.

3.09 SILT FENCE APPLICATIONS

- A. Install geotextile in one piece, or continuously sewn to make one piece, for full length and height of fence, including portion of geotextile buried in toe trench.
- B. Install bottom edge of sheet in toe trench and backfill in a way that securely anchors geotextile in trench.

- C. Securely fasten geotextile to wire mesh backing and each support post in a way that will not result in tearing of geotextile when fence is subjected to service loads.
- D. Promptly repair or replace silt fence that becomes damaged.

3.10 REPAIRING GEOTEXTILE

- A. Repair or replace torn, punctured, flawed, deteriorated, or otherwise damaged geotextile.
- B. Repair Procedure:
 - 1. Place patch of undamaged geotextile over damaged area and at least 18 inches in all directions beyond damaged area.
 - 2. Remove interfering material as necessary to expose damaged geotextile for repair.
 - 3. Sew patches or secure them with heat fusion tacking or with pins and washers, as specified above in Article Securing Geotextile, or by other means approved by Engineer.

3.11 REPLACING CONTAMINATED GEOTEXTILE

- A. Protect geotextile from contamination that would interfere, in Engineer's opinion, with its intended function. Remove and replace contaminated geotextile with clean geotextile.

- END OF SECTION -

SECTION 31 37 00

RIP RAP

PART 1 – GENERAL

1.01 DESCRIPTION

- A. The work of this section consists of furnishing and hand placing stone riprap for embankment and stream bed protection.

1.02 SUBMITTALS

- A. As specified in Section 01 33 00.
- B. Submit Manufacturer's installation instructions for geotextile fabric.

PART 2 – PRODUCTS

2.01 GEOTEXTILE FABRIC

- A. Fabric shall be permeable synthetic material, having the following properties:
 - 1. Grab tensile strength, shall be 200 pounds minimum, tested by ASTM D1682-64.
 - 2. Grab elongation shall be 15-50% as tested by ASTM D1682-64.
 - 3. Burst strength shall be 500 lbs. as tested ASTM D751-79.

2.02 FILTER STONE

- A. Filter stone shall be crushed stone consisting of sound, durable particles of rock in the gradation specified. Stone shall be Georgia D.O.T. Standard Specification, Section 800, size #57.

2.03 RIP RAP

- A. Rip rap shall be well-graded angular quarry stones, sound and hard, resistant to water and weathering. Rock shall be Georgia D.O.T. Standard Specification, Section 805 Type 3. Maximum size shall be 1.0 cubic foot. At least 35% of the mass shall be comprised of pieces which weigh 15 pounds or more.

PART 3 – EXECUTION

3.01 EXCAVATION

- A. Excavate foundation as shown and as specified in Section 603.3 of the Georgia D.O.T. Standard Specifications, Latest Edition. Obtain Engineer's approval of foundation before placing geotextile fabric or riprap. Repair or replace fabric that has been damaged due to stone placement. Re-lay fabric that becomes displaced during stone placement.

3.02 GEOTEXTILE FABRIC

- A. Place on smooth, uniform slope, loosely enough to conform to minor surface irregularities. Follow manufacturer's recommendations for making laps and for fastening and securing

3.03 HAND-LAID RIPRAP

- A. Place largest rocks at bottom of slope. Arrange by hand to interlock and form a substantial bond. Rip rap shall be reasonably uniform and free from bulges, humps, or cavities. Use spalls to fill voids.

- END OF SECTION -

SECTION 32 12 16

ASPHALT CONCRETE PAVING

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. All labor equipment and materials required to furnish and install asphalt concrete paving for roadways and parking areas as shown on the Drawings.

1.2 RELATED WORK

- A. Quality Control: Section 01 45 29

1.3 PAVING CONTRACTOR REQUIREMENTS

- A. A GDOT prequalified General Contractor shall provide all the work described under this specification.
- B. The name of the Paving Contractor shall be submitted to the Owner at least ten (10) business days prior to any construction within any roadway.

PART 2 – PRODUCTS

2.1 GRADED AGGREGATE BASE COURSE

Section 815, GDOT Standard Specifications, latest edition.

2.2 BITUMINOUS PRIME COAT

Section 821, GDOT Standard Specifications, latest edition. Viscosity grade MC-70.

2.3 ASPHALTIC CONCRETE BINDER COURSE

Section 828, GDOT Specifications, latest edition.

2.4 BITUMINOUS TACK COAT

Section 822, GDOT Standard Specifications, latest edition. Grade SS-1 or SS-1h.

2.5 ASPHALTIC CONCRETE SURFACE COURSE

Section 828, GDOT Standard Specifications, latest edition, 12.5mm.

2.6 PAINT TRAFFIC STRIPING

Section 652, GDOT Standard Specifications, latest edition.

2.7 THERMOPLASTIC TRAFFIC STRIPE

Section 653, GDOT Standard Specifications, latest edition.

PART 3 – EXECUTION

- 3.1 Construct graded aggregate base course in accordance with Section 310, GDOT Standard Specifications, latest edition.

- 3.2 Apply bituminous prime coat in accordance with Section 412, GDOT Standard Specifications, latest edition.

- 3.3 Construct asphaltic concrete binder course in accordance with Section 400, GDOT Standard Specifications, latest edition.

- 3.4 Apply bituminous tack coat in accordance with Section 413, GDOT Standard Specifications, latest edition.
- 3.5 Construct asphaltic concrete surface course in accordance with Section 400, GDOT Standard Specifications, latest edition.
- 3.6 Apply traffic striping course in accordance with Section 652, GDOT Standard Specifications, latest edition or Section 653, GDOT Standard Specifications, latest edition as appropriate.
- 3.7 Omit all references to measurement and payment in the GDOT Specifications.
- 3.8 Final pavement will be subject to GDOT and Cobb DOT acceptance for smoothness and trafficability.

- END OF SECTION -

SECTION 32 92 00

GRASSING AND MULCHING

PART 1 – GENERAL

1.01 GENERAL

- A. This work shall consist of ground preparation, furnishing and planting, seeding, fertilizing, sodding and mulching of all disturbed areas.
- B. Areas to be grassed or permanently mulched:
- C. Any areas which were grassed prior to the start of construction shall be grassed after completion. These areas include but are not limited to pipeline trenches, fill and topsoil storage areas and structure excavation.

1.02 JOB CONDITIONS

Schedule work to comply with Section 31 25 00, Erosion and Sedimentation Control.

PART 2 – PRODUCTS

2.01 SEED

The seed shall be an approved mixture for the required type of grass and time of planting.

2.02 FERTILIZER

Commercial grade

2.03 AGRICULTURAL LIME

GDOT Section 882.2

2.04 MULCH

GDOT Section 893.2

PART 3 – EXECUTION

3.01 STAND OF GRASS REQUIRED

It is the intent of this specification that the Contractor is obliged to deliver a satisfactory stand of perennial grass before final payment will be made. If it is necessary to repeat any or all of the work, including plowing, fertilizing, watering and seeding, the Contractor shall nevertheless repeat these operations as a part of this contract until a satisfactory stand is obtained. For the purpose of seeding, a satisfactory stand of grass is herein defined as a full cover, over the areas to be seeded, with grass that is alive and growing, leaving no bare spots larger than one square foot. Bare spots shall be scattered and the total bare areas should not comprise more than 1/100 of any given area.

3.02 LIMING AND GROUND PREPARATION

After the area to be seeded has been brought to finished grade, lime, if it is required, shall be uniformly distributed at a rate of 1 to 2 tons per acre over the seeding area, depending on soil test, with a mechanical spreader. The ground shall be prepared by plowing, disking and harrowing to a depth of at least 4 inches until these areas are friable, well pulverized and the lime is uniformly mixed with the soil. All irregularities in the surface shall be smoothed out. All roots and stones larger than 3 inches to any

dimension, and all other foreign material detrimental to final grading, proper bonding or the proper growth of the planting, shall be removed.

3.03 FIRST APPLICATION OF FERTILIZER

Commercial fertilizer grades 4-12-12, 6-12-12 or 5-10-15 shall then be distributed uniformly at the rate of 1,500 pounds per acre and shall be uniformly mixed with the soil to a depth of at least 4 inches by disking, harrowing or by other methods acceptable to the Engineer. Fertilizer shall not be applied when the wind makes it difficult to get satisfactory distribution.

3.04 SEEDING

The seed shall be a mixture as shown in the table below, and shall be applied at the rates shown in the table:

APPLICATION		
<u>Season</u>	<u>Kinds of Seed</u>	<u>Pounds Per Acre</u>
Jan. 1-May 15	Unhulled Common Bermuda	45
	Kentucky 31 Fescue	150
May 16-Sept. 1	Hulled Common Bermuda	75
Sept. 2-Dec. 31	Unhulled Common Bermuda	45
	Kentucky 31 Fescue	150

The seed shall be uniformly sown by approved mechanical power drawn drills or, in small areas, by mechanical hand seeders. The seeds shall be covered and compacted to a depth of 1/8 to 1/2 inch by means of a cultipacker and an empty traffic roller or another roller weighing less than 3 tons. Broadcast seeding shall not be done when the wind makes it difficult to get satisfactory distribution.

3.05 MOISTURE

Seed shall not be sown unless the soil has the optimum moisture content or more through a depth of at least 4 inches, nor shall it be sown when there is frost in the ground. The Engineer has the authority to postpone seeding at any time when weather and moisture conditions are not favorable.

3.06 MULCH

All areas to be seeded (except those to be sprigged and over-seeded) shall be uniformly mulched in a continuous blanket immediately after seeding using the quantities per acre listed below for each type of mulching material.

Straw, Hay, Forest Litter, Hulls	1 1/2 tons
Stalks	2 tons
Manure	4 tons
Peat or Mulch	135 C.Y.

The rate of application will correspond to a depth of at least one inch and not more than one and one half inches, according to the texture and moisture content of the mulch material. It is intended that mulch shall allow some sunlight to penetrate and air to circulate, at the same time shading the ground, reducing erosion and conserving soil moisture. The contractor shall take steps necessary to prevent loss of mulch or bunching of mulch as caused by the wind.

3.07 WATERING

After the seeds have been sown, the soil will be maintained in a moist state until seed germination has occurred. After germination, if there is not enough moisture in the soil to insure adequate plant growth, water shall be applied until an adequate moisture content has been reached. Water shall not be applied when there is danger of freezing.

3.08 MAINTENANCE

The Contractor will be required to do all maintenance necessary to keep all seeded areas in a satisfactory condition until the work is finally accepted. This includes mowing, repairing washes that occur, and additional seed, fertilizer and water if they are needed. Mowing will be required at most four weeks apart during growing season.

3.09 STAND OF GRASS

If, after a suitable growth period, a satisfactory stand of grass is not evident, the unsatisfactory areas shall be reseeded, including any additional ground preparation and fertilizing necessary, using the type of seed specified.

3.10 SEEDING SCHEDULE

The Contractor shall grass disturbed areas as construction progresses. Not more than 1,000 feet of line shall be left un-grassed at any time.

- END OF SECTION -

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SECTION 33 05 16.13

PRECAST CONCRETE STRUCTURES

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section Includes: Requirements for providing precast concrete structures, manholes, wet wells, vaults, and other miscellaneous structures or members.

1.02 REFERENCE STANDARDS

- A. All work hereinafter shall comply with current and applicable portions of the following:
1. American Concrete Institute (ACI) Publications.
 2. American Society for Testing and Materials (ASTM) Publications.
 3. American Welding Society (AWS) Publications.
 4. ACI 318, Building Code Requirements for Reinforced Concrete.
 5. Precast/Prestressed Concrete Institute (PCI).

1.03 QUALITY ASSURANCE

- A. Acceptable Manufacturers and Erectors shall have had a minimum of 5 years of experience in precast structural concrete work of the quality and scope required on this project. The producer shall have an established written quality assurance program in effective operation at their plant attested to be a current enrollment of the plant in the PCI "Certification Program for Quality Control" or a Quality Control Program acceptable to the Engineer. The written Quality Control Program will be furnished to the Engineer upon request.
- B. Design
1. Structural members have been indicated on the drawings by general size and depth. The structural analysis and design of these items as well as lifting devices for all precast concrete members shall be performed by the manufacturer of the precast materials and subject to review of Engineer.
 2. Design shall be in accordance with ACI 318, latest edition, and under the supervision of a Professional Engineer registered in the state where the project is located.
 3. Design loads shall consist of dead load, live load, impact load, and loads due to water table and any other loads which may be imposed upon the structure. Unless noted otherwise, live loads shall be for HS-20 per AASHTO standard specifications for highway bridges and design wheel loads shall be 16 kips. The live load shall be that which produces the maximum shear and bending moments on the structure.
 4. Before shipment, all concrete members shall be inspected to determine that materials and workmanship conform to the requirements of these specifications and the manufacturer/vendor quality control program.
- C. Allowable Tolerances
1. Dimensions and cambers shall be within the tolerances as described in PCI MNL-116, Division V, Section 5.

2. Deflection: Deflection under design live load shall not exceed calculated deflection by more than 10 percent.
- D. Sampling and Testing
1. General
 - a. Samples and tests required below and other tests are to be made by and at the Contractor's expense. The tests shall be performed by an independent commercial testing laboratory or by the manufacturer's lab subject to review by the Engineer. Compressive strength tests for initial prestress may be performed in the manufacturer's plant laboratory. Certified copies of test reports shall be furnished as required in this Specification, and shall include all test data and results.
 2. Concrete Testing
 - a. During the progress of the work, plastic concrete, as delivered to the casting site, shall be sampled and tested for slump, air content and compressive strength in accordance with ACI 381, Part 2, Chapter 3, and Part 3, Chapter 4. No fewer than 6 cylinders shall be made during each concreting cycle. Not more than 1 test in 10 shall fall below the specified strength.
 3. Slump Tests
 - a. Slump tests shall be in accordance with ASTM C 143.
 4. Failure to Meet Strength Requirements
 - a. If compressive strength tests fail to meet the above requirements, the Engineer may require load tests to be made in accordance with ACI 318. Units failing to meet requirements of the load tests shall not be used. Load tests shall be performed at the expense of the Contractor.

1.04 SUBMITTALS

- A. Shop Drawings
 1. Furnish complete details of design, manufacture, fabrication, installation and erection in accordance with the contract conditions. Location of all inserts and openings shall be shown.
- B. Design computations shall be submitted with shop drawings for review prior to manufacture of any units and shall bear the seal of the Professional Engineer who performed or approved the design and is registered in the state where the project is located. All design loads shall be clearly shown.
- C. Each precast concrete unit shall be properly identified by a specific mark, to appear both on the shop drawings and on the manufactured unit. These identifying marks are to be clearly visible to facilitate proper erection and installation.
- D. All connections, bearings, and anchorage details shall be shown on the shop drawings. The precast concrete manufacturer, subject to review of Engineer, will be permitted to modify any details shown on the drawings provided such modifications will be equally or more efficient and more consistent with the latest recommended practices of the Precast/Prestressed Concrete Institute, and at no additional cost to the Owner. All cast-in connection components shall be designed with positive anchorage which shall be accomplished by having the anchors attached to or around reinforcing steel wherever possible.

- E. Design loads, used in design of the precast concrete section, shall be indicated on the shop drawings.
- F. Certificates of Conformance
 - 1. Before delivery of materials and equipment, four (4) notarized certificates attesting that materials and equipment meet the requirements specified shall be submitted to the Engineer for review.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery

- 1. Precast structures and members shall be inspected upon delivery to the erection site and stored in a manner that will prevent staining and damage.
- 2. Substantially damaged, cracked, or broken units which are deemed unsuitable for the intended use shall be rejected and removed from the site at no cost to the Owner.
- 3. The Engineer's decision will be final in determining unsuitable units.

B. Handling

- 1. Precast concrete members shall be lifted and supported during transportation only at the lifting and/or support points shown on the Shop Drawings. Only lifting devices embedded in these sections by the manufacturer shall be used, unless specific authorization to use other lifting points is received in writing from the manufacturer.
- 2. Proper equipment shall be used to transport the precast concrete sections to the job site. Trucks and trailers with sufficient capacity to handle the heaviest sections specified, without overloading the access routes, must be used. Units damaged due to racking or twisting will be rejected whether damaged on site and route or at the plant.
- 3. Proper access on the job site shall be provided by the contractor to permit transportation units to proceed under their own power to a location accessible to erection units.

C. Storage

- 1. Store precast structures or members off the ground on wooden blocking, pallets, or other appropriate means away from brush, and in areas accessible for inspection.

D. Repair or Replacement

- 1. Repair damage or defects if Engineer deems repairable and at his direction.
- 2. Remove and replace at no cost to the Owner if Engineer deems damage or defects are not repairable by Contractor.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Reinforced Concrete Materials: As modified herein, except that slump requirement shall not apply to manholes.
- B. Precast Concrete Manholes: ASTM C478 except:

1. Compressive Design Strength of Concrete
 - a. Minimum 5,000 psi using Type II cement.
 - b. Minimum compression cylinder test of 4,000 psi at time of shipment.
2. Configurations: Follow Drawings and Standard Details.
3. Joints: ASTM C443.
4. Appurtenances.
 - a. Steps: Manufacturer standard details.
 - b. Bolt inserts: Follow Standard Details.
 - 1) Embed one of following a minimum of 3 inches, to accommodate $\frac{3}{4}$ -inch diameter bolts.
 - a) Heckmann Building Products Corporation, No. 444 Star Threaded Inserts.
 - b) Pennsylvania Insert Corporation, the Liberator.
 - c) Atlantic Concrete Products Co., Bolt Slot Insert System.
 - d) Strut Service Company inserts.
5. Manhole Identification: Clearly marked on inside near top where applicable.
 - a. ASTM Specification designation.
 - b. Manhole setting number (bases only) and Owner project number.
 - c. Date of manufacture.
 - d. Production control number for tracking manufacture phases of item and name or trademark of manufacturer.
 - e. Lined manholes: Stenciled with waterproof paint or ink markings as noted herein that cannot be easily removed from lining or epoxy coated surfaces.
6. Precast Manhole Sections
 - a. Approved Manufacturers:
 - 1) Tindall
 - 2) Oldcastle
 - 3) Or approved equal
7. Precast Concrete Grade Rings: ASTM C478, except:
 - a. Compressive Design Strength of Concrete: Minimum 5,000 psi using Type II cement.
 - b. Configurations: Follow Standard Details.
 - c. Rings: Drilled with holes 1½- to 2-inch diameter to accommodate frame anchor bolts.
 - 1) Grade rings with cracks or fractures passing through height of ring and any continuous crack extending for length of 3 inches or more will be rejected.

- 2) Rings with damaged edges which will prevent making satisfactory joint in the opinion of the Engineer will be rejected.
 - 3) Planes of ring surfaces: Within limits of plus or minus ¼ inch of horizontal and vertical, except for sloped adjusting grade ring to be within ¼ inch of Standard Detail.
 - 4) Protection:
 - a) On lined manholes: Follow manufacturer's recommendations.
 - d. Approved manufacturers:
 - 1) Atlantic Concrete Products Company
 - 2) Americast
 - 3) Contractors Precast Corporation
 - 4) Hanson Concrete Products
 - 5) Dal-Col Products, Inc.
 - 6) Prism Precast Products, Inc.
 - 7) Frederick Precast Concrete, Inc.
 - 8) Or approved equal
8. Precast Concrete Vaults and Wet Well: ASTM C858
- a. Configurations: Follow drawings.
 - b. Identification: Clearly mark inside of each precast concrete vault section.
 - 1) ASTM Designation.
 - 2) Structure size.
 - 3) Date of manufacture.
 - 4) Project station location and Owner project number.
 - 5) Name or trademark of manufacturer.
 - 6) Mark slabs on top and bottom surfaces.
 - c. Design Mixes
 - 1) 5,000 psi at 28 days using Type II cement.
 - 2) Mix proportion: ACI 318.
 - d. Approved Manufacturers
 - 1) Tindall
 - 2) Oldcastle
 - 3) Or approved equal
 - e. Vault Access Doors
 - 1) Vault access doors shall be fabricated aluminum, 4 feet wide by 4 feet long, unless otherwise specified by the Engineer. Access doors shall mount flush with the surrounding area.

- 2) Access doors shall be equipped with heavy brass hinges, stainless steel pins, compression spring operators, an automatic hold-open arm with release handle and a locking device, to receive a padlock.
 - 3) All vaults located within roadways shall be H-20 rated traffic doors. Vaults in other locations shall have parkway doors, unless otherwise specified by the Engineer.
 - 4) Access doors shall be Type JD-AL as manufactured by the Bilco Company, New Haven, Connecticut, or approved equal.
9. Miscellaneous Materials
- a. Granular Bedding: ASTM C33 coarse aggregate size number 4.
 - b. Weep holes: Service weight cast iron covered with non-erodible filter on earth side.
10. Manhole Ring and Cover
- a. Manhole covers shall be of cast iron or ductile iron. The ring and cover shall provide a 30-inch diameter access opening. The cover shall have two pickbars; each pickbar shall be 1-inch diameter and made from stainless steel. The ring cover shall be East Jordan B-30 Frame with 1810B4 Cover, or approved equal. The word "WATER" shall be cast on the cover in letters approximately two (2) inches high. All manhole covers shall be vented with twenty-four (24) one (1) inch diameter holes, six in each quadrant.
 - b. All rings not located in paved areas shall be cast-in the "flat top".
 - c. These castings are manufactured to withstand highway traffic loads, exceeding AASHTO H-20/HS-20 specifications (wheel loads of 16,000 pounds with a tire contact area of 8" x 20").
 - d. Grey Iron castings shall conform to the requirements of AASHTO M 105 Class 35 B or ASTM A 48 Class 35 B, unless otherwise specified.

2.02 SOURCE QUALITY CONTROL

- A. Test Equipment: Instruments, gages, and other testing and measuring equipment of proper range, type, and accuracy to verify conformance with specification requirements.
1. Ensure equipment is calibrated and certified at annual intervals.
 2. Calibrate against measurement standards with known relationship to existing national standards.
 3. Calibrate and certify gages on equipment to which they belong, and keep them on equipment following certification.
 4. Do not use instruments, gages, testing, and measuring equipment found to be out of calibration or adjustment until applicable requirements have been met.
 5. Calibration by agency regularly engaged in this type of activity.
- B. Precast Manhole Testing
1. Joint and Barrel Testing: ASTM C443.

2. Plant vacuum testing: ASTM C1244.
- C. Acceptance Procedure for Concrete Strength of Precast Manhole Sections: Procedure applies to acceptance and approval of precast manhole bases, riser, and cone sections, flat top slabs, and grade rings.
1. Concrete Design Mix Approval: Based on submittal specified above herein.
 - a. The Owner will issue approval for up to 3 years, provided design mix materials and sources are not changed and in-plant concrete testing of manhole sections continues to be accepted without rejection of more than 2 days' production in a row.
 - 1) Every 3 years thereafter, and under failure conditions stated above resubmit concrete design mix for approval.
 - 2) Production from mixes other than those approved will be rejected.
 - b. Compressive strength test: ACI 301 and ACI 318.
- D. Vaults and Other Precast Concrete Structures
1. Determination of concrete compressive strength: from compressive tests made on concrete cylinders.
 2. Unless otherwise specified, retain independent testing facility approved by Engineer for molding, capping, and testing concrete cylinders following appropriate ASTM requirements or, at Engineer's option, make cylinders and use own equipment to test.
 - a. Furnish test results to Engineer.
 - b. Engineer may require core samples of finished product.
 - c. When requested by Engineer, furnish compressive test specimens for testing in addition to requirements above, and continue to monitor quality of concrete.
 3. Notify Engineer at least 10 working days prior to pouring any structure.
 4. The Owner may perform random or full inspections of manufacture of boxes, vaults, and precast structures to inspect:
 - a. Steel placement and size.
 - b. Overall fabrication.
 - c. Workmanship.
 - d. Other general or specific aspects of production and specification compliance.

PART 3 – EXECUTION

3.01 EARTHWORK

- A. The Contractor shall prepare an excavation large enough to accommodate the structure and permit grouting of openings and backfilling operations.
- B. The bottom of the structure shall be placed on 6 inches of compacted, crushed rock subbase, and graded level to the elevation as shown on the plans.

- C. Vault excavations shall be backfilled with imported granular material to a minimum relative density of 95 percent standard proctor method as determined by ASTM D-698.

3.02 INSTALLATION

- A. Openings or "knockouts" in precast concrete vaults shall be located as shown on the drawings and shall be sized sufficiently to permit passage of the largest dimension of pipe and/or flange.
- B. Upon completion of installation, all voids or openings in the vault walls around pipes shall be filled with 3,000 psi non-shrink grout.
- C. After the structure and all appurtenances are in place and approved, backfill shall be placed to the original ground line or to the limits designated on the plans.
- D. All joints between precast concrete vault sections shall be made watertight. The plastic joint sealing compound shall be installed according to the manufacturer's recommendations to provide a watertight joint which remains impermeable throughout the design life of the structure.
- E. Access doors shall be built up such that the hatch is flush with the surrounding surface unless otherwise specified on the drawings or by the Engineer. The Contractor is responsible for placing the cover at the proper elevation where paving is to be installed and shall make all necessary adjustments so that the cover meets these requirements.

3.03 FIELD QUALITY ASSURANCE

- A. Perform field testing of precast concrete structures required under other sections of these specifications.

- END OF SECTION -

SECTION 33 05 24

STEEL PIPE

PART 1 – GENERAL

1.01 Description

Scope of Work: Provide and install steel pipe of the sizes and in the locations shown on the Plans and as specified herein.

1.02 Quality Assurance

Commercial Standards: Unless otherwise stated, the latest edition for any commercial standards and all manufacturing tolerances referenced therein shall apply.

ANSI/AWS D1.1	Structural Welding Code- Steel
ANSI/AWS B2.1	Specification for Welding Procedure and Performance Qualification
ANSI/AWWA C200	Steel Water Pipe - 6 In. (150 mm) and Larger
ANSI/AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger- Shop Applied
ANSI/AWWA C206	Field Welding of Steel Water Pipe
ANSI/AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)
ANSI/AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
ANSI/AWWA C216	Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fitting
ANSI/AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings
ASME Section IX	International Boiler & Pressure Vessel Code: Welding and Brazing Qualifications
AWWA M11	Steel Water Pipe: A Guide for Design and Installation
SSPC-PA 2	Systems and Specifications SSPC Painting Manual, Volume 2 Chapter 7: Measurement of Dry Coating Thickness with Magnetic Gages

A. Qualifications

1. Manufacturers who are fully experienced, reputable, and qualified in the manufacture of the products to be furnished shall furnish all steel pipe and fittings. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
2. Pipe cylinders, lining, coating and fabrication of specials shall be the product of one manufacturer that has not less than 10 years of successful experience manufacturing pipe of the particular type and size indicated. The Pipe Manufacturer must have a certified quality assurance program. This certified program shall be ISO 9001:2000 or other equivalent nationally recognized program as approved by the Engineer.

B. Acceptable Manufacturers

1. American Spiralweld
2. Northwest Pipe Company
3. Thompson Pipe Group

1.03 Submittals

A. Shop Drawings

Drawings shall be submitted to the Engineer for approval and shall include the following:

1. Pipeline layout showing stations and elevations.
2. Details of standard pipe, joints, specials and fittings.

B. Design

1. Calculations for pipe design and fittings reinforcement and/or test data.
2. Details of joint bonding and field welded joint restraint calculations.

C. Certifications

1. The Contractor shall furnish a certified affidavit of compliance that meets or exceeds the requirements of these specifications for all pipe and fittings furnished.
2. Linings for potable piping shall be NSF certified.

1.04 Verification

A. Inspections

1. All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of AWWA C200 and AWWA coating and lining standard as supplemented by the requirements herein.

B. Tests

1. Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of AWWA C200 and AWWA coating and lining standards.
2. The Contractor shall perform required tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Contractor, provided that the Contractor's schedule is not delayed for the convenience of the Engineer.

C. Welding Requirements

1. All welding procedures used to fabricate pipe shall be qualified under the provision of AWS B2.1 or ASME Section IX.

D. Welder Qualifications

1. Skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall maintain current qualifications under the provisions of AWS B2.1 or ASME Section IX. Machines and electrodes similar to those in the work shall be used in qualification tests. The Contractor shall furnish all material and bear the expense of qualifying welders.

1.05 Handling, Storage and Shipping

- A. Pipe shall be stulled as required to maintain roundness of +/- 1% during shipping and handling.
- B. Coated pipe shall be shipped on padded bunks with nylon belt tie-down straps or padded banding located approximately over stulling.
- C. Coated pipe shall be stored on padded skids, sand or dirt berms, sand bags, old tires or other suitable means so that coating will not be damaged.
- D. Coated pipe shall be handled with wide belt slings. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.
- E. Prior to shipment, dielectrically coated pipe shall be visually inspected for damage to the coating by the following procedure:
 1. When visual inspection shows a dielectric coating system has sustained physical damage, the area in question shall be subjected to an electrical holiday test. Voltage shall be per AWWA C222.
 2. When the area is tested and there are no holidays, the area shall be noted "OK" and shipped with no patching required.
 3. When the damaged area does show damage going clear to the steel from either a visual inspection or a jeep from a holiday detector, the area shall be repaired in

accordance with Section 2.02 of these specifications and per manufacturer's recommendations.

1.06 Markings

- A. The Contractor shall legibly mark all pipes and specials in accordance with the laying schedule and marking diagram. Each pipe shall be numbered in sequence and said number shall appear on the laying schedule and marking diagram in its proper location for installation. All special pipe sections and fittings shall be marked at each end with top field centerline.

PART 2 – PRODUCTS

2.01 Materials

A. Pipe

1. Steel pipe shall conform to AWWA C200. Steel plate used in the manufacture and fabrication of steel pipe shall meet the requirements of AWWA C200. All longitudinal and girth seams, whether straight or spiral, shall be butt-welded using an approved electric-fusion-weld process.
2. Pipe shall be designed for 15 psi working pressure with an additional 10 psi allowance for surge. Pipe design shall be in accordance with AWWA M11, subject to the minimum wall thickness and use of stiffeners at each location.
3. Pipe shall be bedded and backfilled using Type 4 Bedding.
4. Pipe is to be furnished principally in 50-foot net laying lengths with shorter lengths, field trim pieces and closure pieces as required by Plan and profile for location of elbows, tees, reducers and other in-line fittings. Or as required for construction. The pipe fabricator shall prepare a pipe laying schedule showing the location of each piece by mark number with station and invert elevation at each bell end.

B. Fittings

1. Unless otherwise shown on the Plans, all specials and fittings shall conform to the dimensions of AWWA C208. Pipe material used in fittings shall be of the same material and pressure class as the adjoining pipe. The minimum radius of elbows shall be 2 ½ times the pipe diameter and the maximum miter angle on each section of the elbow shall not exceed 11 ¼-degrees (one cut elbow up to 22 ½-degrees). If elbow radius is less than 2 ½ times the pipe diameter, stresses shall be checked per AWWA M-11 and the pressure class increased if necessary.
2. Fittings shall be equal in pressure class design as the adjoining pipe. Specials and fittings, unless otherwise shown on the Plans, shall be made of segmental welded sections from hydrostatically tested pipe, with ends compatible with the type of joint or coupling specified for the pipe. All welds made after hydrostatic testing of the straight sections of pipe shall be tested per the requirements of AWWA C200 Section 5.2.2.1.

C. Joints

1. Lap Weld

- a. Lap weld joints shall conform to AWWA C200 and as shown in Chapter 6 of AWWA M11 or pertinent chapter of the most recent version of AWWA M11.
- b. Lap field welded joints shall be used where restrained joints are required or indicated on the Plans. The standard bell shall provide for a 2 ½-inch lap. The minimum lap shall be 1-inch. The design maximum joint deflection or offset shall be a 1-inch joint pull.
- c. Lap welded joints shall be welded either externally or internally. Holdbacks for coating and linings shall be provided as shown on the approved shop drawings. "Weld-after-backfill" of interior welds may be performed any time after joint completion and backfilling has been completed.
- d. Unless otherwise shown on the Plans, all field joints shall be lap welded.

2. Mechanical Couplings

- a. Mechanical couplings where indicated on the Plans shall comply with AWWA C219 and shall be Smith Blair Style 411, Romac Style 400, Victaulic Depend-O-Loc or equal. Couplings shall be harnessed in conformance with AWWA M11.
- b. Couplings for buried service shall have all metal parts painted with polyurethane paint and conform to AWWA C222 or epoxy coated in conformance with AWWA C210.
- c. Pipe ends for mechanical couplings shall conform to AWWA C200 and M11. The shop applied outside coating shall be held back as required for field assembly of the mechanical coupling or to the harness lugs or rings. Harness lugs or rings and pipe ends shall be painted with one shop coat of polyurethane conforming to AWWA C222 or epoxy coated in conformance with AWWA C210.
- d. Pipe for use with sleeve-type couplings shall have plain ends at right angles to the axis.

3. Flanges

- a. Flanges shall be in accordance with AWWA C207 Class E. Shop lining and coating shall be continuous to the end of the pipe or back of the flange. Flange faces shall be shop coated with a soluble rust preventive compound.
- b. Gaskets shall be full face, 1/8-inch thick, cloth-inserted rubber, Garlock 3000, John Crane Co. Style 777 or equal.

4. Bolts and Nuts for Flanges

- a. Bolts for Class E and F flanges shall be ASTM A 193, Grade B7 and nuts shall be ASTM A 194, Grade 2H heavy hex.

5. All unwelded pipe joints shall be bonded for electrical continuity in accordance with the Pipe Manufacturer's recommendations unless otherwise specified in the Plans.

2.02 Linings and Coatings

A. Cement-mortar Lining

1. Interior surface of all steel pipe, fittings and specials shall be lined in the shop with cement-mortar lining applied centrifugally in conformity with AWWA C205.
2. Holdbacks shall be left bare and be provided as shown on the approved shop drawings. Holdbacks shall be filled with cement mortar after joint completion per AWWA C205.
3. Defective linings as identified in AWWA C205 shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.
4. Fittings shall be cement-mortar lined per AWWA C205. Pipe and fittings too small to cement-mortar line may be lined with AWWA C210 epoxy or AWWA C222 polyurethane.
5. Cement-mortar lining shall be kept moist during storage and shipping. The Contractor shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.

B. Polyurethane Coating

1. Polyurethane coating shall be per AWWA C222 to a minimum thickness of 25 mils, measured in accordance with SSPC-PA 2. Coating shall be continuous to the ends of the pipe except where field welding is indicated. Exterior field joints shall be completed utilizing heat-shrink sleeves per AWWA C216.
2. Coating repairs shall be per AWWA C222 and paint manufacturer's recommendations.

C. Epoxy Coating

1. Polyurethane coating shall be per AWWA C210, Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
2. Coating repairs shall be per AWWA C210 and epoxy manufacturer's recommendations.

PART 3 - EXECUTION

3.01 Installation

A. The Contractor shall provide and install all required piping and accessories in accordance with the contract documents, manufacturer's recommendations and in conformance with AWWA C604. Pipe installation as specified in this section supplements AWWA M11.

B. Installing Buried Piping

1. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or roll pipe into trenches under any circumstances.
2. Inspect each pipe and fitting before lowering into the trench. Inspect the interior and exterior protective coatings. Repair damaged areas in the field in accordance with Section 2.02. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
3. Grade the bottom of the trench and place a 6-inch minimum layer of select or scarified material under the pipe. Before laying each section of pipe, check the grade and correct any irregularities found. The trench bottom shall form a uniform bearing and support for the pipe.
4. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides to permit completion and visual inspection of the entire joint.
5. Keep the trench in a dewatered condition during pipe laying.
6. When the pipe laying is not in progress, including the noon hours, close the open ends of the pipe. Do not permit trench water, animals, or foreign objects to enter the pipe.
7. If pipe is attached to a butterfly valve outside the trench, the assembly shall not be lifted by the butterfly valve but shall be lifted by the pipe on both sides of the valve in a manner that does not place strain on the valve ends or otherwise damages the valve or pipe.

C. Joints Assembly

1. Rolled Groove Rubber Gasket Joint
 - a. Clean exposed ends of joint surfaces.
 - b. Thoroughly lubricate the gasket with material approved by the Pipe Manufacturer.
 - c. Place gasket in grooved spigot and relieve tension by inserting a dull instrument under the gasket and completing at least two revolutions around the joint circumference.
 - d. Upon completion of insertion of spigot (including any angular deflection as shown on the approved shop drawing) and prior to releasing from slings the

entire placement of the gasket should be checked with a feeler gauge per manufacturer's recommendations. If gasket has disengaged or rolled, immediately pull the joint apart and reinstall the joint with a new gasket if required. Again, verify proper placement of gasket with feeler gauge.

- e. It is recommended that bonding wires or clips be installed as supplied by the Pipe Manufacturer unless otherwise required in the Plans.
- f. Grout the interior of the joints with cement mortar per AWWA C205. Complete the exterior of the joints with heat-shrink sleeves per AWWA C216 and manufacturer's recommendations.

2. Lap Field Welded Joints

- a. Clean exposed end of joint surfaces.
- b. Provide a minimum overlap of 1-inch at any location around the joint circumference.
- c. Field welders and field weld procedures shall be certified in accordance with AWS D1.
- d. At the Contractor's option, provide a full fillet weld per AWWA C206 either on the inside or outside of the pipe. Inside welding may be performed after backfilling in accordance with manufacturer's recommendations.
- e. Testing of field welds shall be in accordance with AWWA C206.
- f. Grout the interior of the joints with cement-mortar per AWWA C205. Complete the exterior of the joints with heat-shrink sleeve per AWWA C216 and manufacturer's recommendations.

3. Flanged Joints

- a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing; lubricate bolts with graphite or oil.
- b. Insert the nuts and bolts (or studs), finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
- c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.
- d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or re-tighten the bolts and nuts, and retest the joints.

3.02 Field Quality Control

- A. Backfill in accordance with Sections 31 23 16, Excavation, and 33 11 13, Water Main Construction.

- B. Perform hydrostatic pressure test in the presence of the Engineer. Field test pressure should not exceed 120% of the pipes rated pressure class as measured at the lowest elevation for the section being tested. Leakage allowance shall be per AWWA M11 Chapter 12.
- C. Provide all necessary piping between the reach being tested and the water supply, together with all required materials and equipment.
- D. Provide dished heads, blind flange or bulkheads as necessary to isolate and test pipeline.
- E. Methods and scheduling of tests to be approved by the Engineer.
- F. Protect pipes and provide thrust restraint as required to complete test.
- G. Provide for proper legal disposal of test water.

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WATER MAIN CONSTRUCTION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. The work includes furnishing all material, labor, tools, equipment, skills, and incidentals necessary to furnish and install ductile iron pipe and to install steel pipe. Refer to Section 33 05 24 for specifications of steel pipe materials.

1.02 ORDER OF WORK

- A. The section on Project Coordination designates the starting point, or points, for construction and the order in which the work should be constructed, completed, and placed into operation.

1.03 SINGLE SOURCE OF PIPE AND FITTINGS

- A. A single pipe manufacturer will be responsible for providing all 6" through 42" ductile iron pipe on this project. This pipe manufacturer will be responsible for the quality of all pipe materials and shall provide a one-year warranty for all materials supplied for this project.

1.04 SUBMITTALS

- A. The Contractor shall submit for review a pipe laying schedule and pipe laying drawings for the project. Both the schedule and drawings shall be provided by the pipe manufacturer. Both the schedule and drawing shall include all pipe, fittings, and valves to be installed for this project.

PART 2 – PRODUCTS

2.01 GENERAL

- A. The Contractor shall furnish all materials and incidental items (whether or not they are specifically described herein) necessary to complete all work called for under the contract, except for any items that are specifically listed in these contract documents as being furnished by the Owner.

2.02 DUCTILE IRON PIPE FOR WATER MAINS AND OTHER YARD PIPING

- A. Pipe - Pipe for water mains and other yard piping shall be ductile iron (DIP) designed and manufactured in accordance with the latest revision of ANSI/AWWA C151/A21.51. Each pipe shall be subjected to a hydrostatic test pressure of at least 500 psi at the time and place of manufacture. Pipe wall thickness shall be sufficient to meet the above conditions, and as shown on the contract drawings.
- B. The Pressure Class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
- C. Ductile Iron Pipe shall have an outside asphaltic coating in accordance with the latest revision of ANSI A21.51-81. The exterior of ductile iron pipe shall be coated

with a layer of arc-sprayed zinc. The mass of the zinc applied shall be 200 grams per square meter of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. All pipe shall be zinc-coated at the pipe manufacturer's facility. The Ductile Iron Pipe shall also have an inside cement lining and asphaltic seal coat in accordance with the latest revision of ANSI/AWWA C104/A21.4.

- D. Owner has found that pipe manufactured by American Cast Iron Pipe Company and US Pipe meets the requirement of this specification. Therefore, pipe shall be as manufactured by the above-named manufacturers. No substitution is permitted.
- E. Pipe Joints - Pipe joints shall be as the type specified on the project plans. Restrained Joint Pipe shall be:
 - 1. For DIP larger than 24", restrained by Flex-Ring joints, TR Flex joints or approved equal. Field Flex-Ring, or similar device by other pipe manufacturers approved in this section of the specifications, which is a boltless and glandless way of restraining field connections and does not require a factory weldment, is acceptable for cut sections of pipe only.
 - 2. For 6" through 24" DIP water main, restrained by Fast-Grip gaskets inserted in Push-On Joints or approved equal.
 - 3. For all mechanical joints, restrained according to Section 2.9 of this specification titled "Mechanical Joint Restraint Devices."
 - 4. Standard "Push-On" type joints shall be in accordance with the latest revision of ANSI/AWWA C111/A21.11 and furnished complete with gaskets.
- F. Inspection and written certification that the pipe meets all applicable specifications will be required in accordance with section 51-4 of ANSI A21.51-81. A written transcript of foundry acceptance tests must be furnished in accordance with section 51-14 of ANSI A21.51-81. These documents must be forwarded to the engineer prior to shipping of pipe.
- G. Fittings shall be ductile iron. Fittings shall have a coating consisting of Tnemec Series 94H20 Hydro-Zinc primer and Tnemec Series 22 Epoxoline Finish Coat Polyamine Epoxy. Both primer and finish coat shall be ANSI/NSF Std. 61 Certified. The coating system as applied shall have a zinc level of at least 200 grams per square meter of surface area. Fittings shall have a standard asphaltic coating on the exterior. Fittings shall also have a cement-mortar lining and asphaltic seal coat on the interior in accordance with ANSI/AWWA C104/A21.4, latest revision. Fittings shall have the word "Zinc" stenciled on the exterior. Fittings without the word "Zinc" on the exterior shall be removed from the site.
- H. Fittings and accessories shall be furnished with Mechanical Type Joints in accordance with ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53, latest revision.
- I. Owner has found that fittings and restraint devices manufactured by American Cast Iron Pipe Company, Sigma Corporation, or Star Pipe Products, meet the requirements of this specification. Therefore, fittings and restraint devices shall be as manufactured by the above-named manufacturers. No substitution is permitted.

- J. Outlets shall be of the type shown on plans and shall be furnished by the pipe manufacturer. Refer to section titled Welded-On Outlets for additional requirements.

2.03 POLYETHYLENE ENCASEMENT

- A. **Polyethylene tubing shall be used on all DIP and on to encase all bolts, nuts and hardware on steel pipe**, shall be manufactured of virgin polyethylene material conforming to the requirements specified in AWWA C105 and shall consist of two distinct tubes.
- B. The first tubing touching the pipe shall be 8-mil, white in color, consisting of three layers of co-extruded linear low density polyethylene (LLDPE) film that are fused into one. The inside surface shall be infused with a blend of an anti-microbial biocide to mitigate microbiologically influenced corrosion ("MIC") and a volatile corrosion inhibitor ("VCI") to control galvanic corrosion. The tubing shall be V-Bio as developed by the Ductile Iron Pipe Research Association (DIPRA), or approved equal.
- C. The second tubing, installed on top of the V-Bio, shall be 8-mil polyethylene tubing (LLD) for water mains and shall be black in color.
- D. Tape for polyethylene tubing shall be as provided by the manufacturers for this specific purpose.

2.04 BUTTERFLY VALVES – Refer to Butterfly Valve section of these specifications.

2.05 GATE VALVES

- A. Valves of diameter 48" and smaller shall be of the Resilient Wedge Gate Valve type design. All gate valves shall be rated for 250 psig cold water working pressure, with zero leakage. The rating shall be indelibly marked on the casting. The valves shall comply fully, in all applicable sizes, with the latest edition of ANSI/AWWA C-515, as well as all requirements detailed herein. The manufacturer shall provide drawings and/or an affidavit detailing compliance with all applicable standards and specifications. All valves shall be of the same manufacturer and shall clearly bear the manufacturer's name and valve size.
- B. Valve body, bonnet and resilient wedge shall be cast, machined, assembled and tested in the United States. Manufacturer must furnish certification that it meets this requirement.
- C. All ferrous components of the valve shall be constructed of ductile iron. All valves shall be cast with the words "DI" or "Ductile Iron". The wrench nut shall be constructed of ductile iron, shall have four flats at the stem connection to insure even transfer of torque to the stem.
- D. The wedge shall be ductile iron. It shall be fully encapsulated with EPDM rubber, symmetrical in design, and shall seat equally well with flow in either direction. The wedge shall incorporate the use of guides encapsulated with an engineered plastic. The valve body guide track shall be of shallow rectangular trough-style design. The wedge-to-stem design valves shall employ the use of an independent stem nut.
- E. All body to body bolting material shall be Type 304 SS, develop the physical strength characteristics of ASTM A307 and shall have the dimensional

requirements of AWWA C-515 and ANSI 18.2.1. All body to bonnet bolting shall be of the same size and length. All bolts shall have square or hexagonal heads.

- F. All stem diameters and the prescribed number of turns to open shall be as detailed in the applicable portions of Table 4, of AWWA C-515. The stem O-rings above the thrust collar shall be replaceable with the valve fully open and while subjected to full working pressure. Valve shall be equipped with thrust washers above and below the thrust collar to reduce the operating torque of the valve. All valves shall open when turned to the left.
- G. All internal and external surfaces of the valve shall be coated prior to assembly, with epoxy. All valve body gaskets shall be of a pressure energized O-ring design.
- H. All valves 14" and larger shall be equipped with lifting lugs or eyebolts for lifting. All valves 16" and larger shall be equipped with spur gearing for vertical installation to reduce operating torque. Valves shall be installed in the vertical position.
- I. Gate valves that are to be installed on ductile iron pipe shall have Mechanical Joint (MJ) ends which must be restrained on each end with restraining glands. Valves used to isolate air and vacuum valves and installed in a manhole shall be flanged. Flange dimensions are to be per B16.1, Class 125 and ANSI/AWWA C110/A21.10. All flange thickness shall be per ANSI/AWWA C110/A21.10.
- J. Resilient Wedge Gate Valves shall be American Flow Control Series 2500, Mueller Series 2360 or 2361, or M&H Style 7571. No substitution is permitted.

2.06 VALVE BOXES

- A. Valve boxes shall be used on isolation valves 12" and smaller and shall be cast-iron with cast iron covers. The barrel shall be multiple-piece, screw type, having 5-1/4-inch shaft. Covers shall have "WATER" cast into the top. Valves which have operating nut at depths greater than 5 feet or valves specifically designated by the drawings shall be composed of a valve box and extension stem. All moving parts of the extension stem shall be enclosed in the valve box housing to prevent contact with the soil. Valve box and extension assembly shall be adjustable to accommodate variable trench depths. A debris cap or seal shall be integral to the assembly to prevent debris, silt, etc. from entering the barrel of the valve box.
- B. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1000 ft-lb without failure. Where the valve and extension stem are located in a manhole, wall support brackets shall be provided at a vertical spacing as recommended by the manufacturer and shall be suitable for installation in a circular manhole.
- C. The valve box shall be as manufactured by Tyler Union, Pentek, or pre-approved equal. The extension stem shall be as manufactured by Trumbull Industries, or pre-approved equal.

2.07 VALVE MARKER

- A. One concrete valve marker shall be furnished and set at each line valve that uses a valve box. The marker shall be made of 3000 psi concrete and shall be four (4) feet long and 4" on each side, with #4 reinforcing bars as shown on the detail.

- B. The markers shall be set an even number of feet between the center line of the valve and the center line of the aluminum disc in the top of the marker, and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

2.08 AIR AND VACUUM RELEASE VALVES

- A. Air release and vacuum break valve shall be of the compact single chamber design with solid cylindrical HDPE control floats housed in a tubular stainless steel body with epoxy powder coated cast iron or steel ends secured by stainless steel tie rods. The valve shall have an integral orifice mechanism, which shall operate automatically to limit transient pressure rise induced by closure to twice the valve rated working pressure. The intake orifice shall be equal to the nominal size of the valve. The flat face of the control float seating against an EPDM "O" ring housed in a dovetail groove circumferentially surrounding the orifice shall effect large orifice sealing. The seating and unseating of a small orifice nozzle on a natural rubber seal affixed into a control float shall control discharge of the pressurized air. The nozzle shall have a flat seating land surrounding the orifice so that damage to the rubber seat is prevented. All components shall be easily replaced. Connection to valve inlet shall be as shown on the plans. The valve shall be Vent-O-Mat series RBX or Vent Tech Model WZW. No substitution is permitted.

2.09 MECHANICAL JOINT RESTRAINT DEVICES (MEGALUGS)

- A. Restraint devices for nominal pipe sizes 3-inch through 20-inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10. The devices shall have a working pressure rating of 350 psi for 3-16 inch and 250 psi for 18-48 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes. Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536. Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN. Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8. Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.
- B. Restraint devices shall be listed by Underwriters Laboratories (3" through 24" inch size) and approved by Factory Mutual (3" through 12" inch size).
- C. Owner has found that restraint devices manufactured by EBBA Iron Sales, Inc., and Sigma Corporation meet the requirements of this specification. Therefore, restraint devices shall be as manufactured by the above-named manufacturers. No substitution is permitted.

2.10 SUBGRADE STABILIZER

- A. Subgrade stabilizer shall consist of crushed stone meeting size and gradation requirements for Georgia DOT, Section 800, Size #57.

2.11 CONCRETE

- A. Concrete for blocking, replacing curb and gutter, replacing sidewalks and miscellaneous concrete shall have a minimum compressive strength of 3,000 psi at 28 days with air entrainment.

2.12 CONCRETE AND GROUT

- A. A mix design, showing amounts of each ingredient for each type mix, shall be submitted for approval.

2.13 SAND FOR BACKFILL

- A. Sand for backfilling over water mains, when required, shall be coarse, well-graded sand relatively free from dirt and other foreign matter. Sand shall be approved by Engineer.

2.14 BRICK

- A. All brick shall be best grade. All hard burned common, acceptable to the Engineer and giving a ringing sound when struck and presenting a regular and smooth face, shall be used. When submerged in water for 24 hours, brick shall not absorb more than 10% of its weight in water.
- B. Bricks shall be culled when delivered on the site and all imperfect brick shall be immediately removed from the work. All salmon, soft or arch brick or brick made of alluvial soil will be rejected. All brick used in the work shall be of uniform size.

2.15 FLOWABLE FILL

- A. Controlled low-strength flowable fill (100 psi maximum) shall comply with GDOT Specification Section 600. A concrete mix design shall be submitted to the Engineer for approval prior to use. The flowable fill shall consist of Portland cement, fine aggregate, air-entraining admixtures, and water proportioned to provide low strength, self-leveling backfill material.

2.16 LOCATOR BALLS AND LOCATOR INSTRUMENT

- A. Locator balls shall be 3M Series EMS iD Ball Markers. The model number shall be 1423-XR/iD.
- B. Contractor shall furnish one locator instrument, which shall be programmable, 3M Dynatel Pipe/Cable/iD Locator 2550-iD/U12 with one carrying bag and rechargeable battery.

2.17 BORROW MATERIAL

- A. Borrow material may be either:
 - 1. Material hauled from borrow areas outside the project area.
 - 2. Suitable material that is excavated from the pipe trench and is unsuitable for immediate use as backfill due to moisture content.
- B. The Contractor shall identify the source of borrow material, have performed the geotechnical testing of the material to determine its suitability as a backfill material, transport the material to the project, and place the material to the specified soil density. The Contractor may choose to stockpile suitable material from the pipe trench that is too wet for immediate use as backfill material. The Contractor shall identify a procedure for drying the material to the optimum moisture content; either through air drying or the addition of lime. This procedure is subject the review of the Engineer and acceptance by the Engineer. The Contractor shall transport the material to the project, and place the material to the specified soil density. Final determination of the suitability of the material is the responsibility of the Engineer.

2.18 FLEXIBLE (TRANSITION) COUPLINGS

- A. Flexible couplings for pipe 12" and smaller shall be Catalog No. 441 as manufactured by Smith-Blair, or approved equal.

2.19 PIPE CONNECTION COUPLINGS

- A. Pipe connections between new pipe and existing pipe shall be made with Dresser Style 90 long steel couplings for pipe sizes 2" and below; for pipe sizes above 2", Mechanical Joint solid sleeves (long style) shall be used. Spacer rings must be used at all solid sleeve locations. A spacer ring is defined as a short section of pipe cut to fit into the gap between the two plain ends of pipe at the sleeve location.
- B. For pipes 20" in diameter and larger, the maximum length of the gap inside long style MJ solid sleeves where the space ring will be located shall be 7 inches; therefore, the maximum length of the spacer ring shall be 7 inches. The maximum gap between the spacer ring and each adjoining pipe shall be one-half inch.

2.20 CORPORATION STOPS AND VALVES

- A. The stop or valve assembly shall be made of heavy brass components constructed of 85-5-5 ASTM B62 brass for strength and durability and shall be rated for a working pressure of 300 psi. The valve shall be operated with a tee head and shall open when turned counter-clockwise. The valve seat seal shall be stainless steel reinforced to ensure a reliable seal under full flow and pressure. The stop or valve shall be Mueller 300 Ball Type Corporation Valve, or approved equal.

2.21 WELDED-ON OUTLETS

- A. Welded-on outlets shall be fabricated from centrifugally cast ductile iron pipe, manufactured and tested in accordance with ANSI/AWWA C151/A21.51. The outlets shall be fabricated at the manufacturer's facilities and shall not be fabricated or modified in the field.
- B. Welded-on outlets shall be produced using qualified procedures and welders as per guidelines contained in ANSI/American Welding Society (AWS) D11.2, Guide for Welding Iron Castings.
- C. Welded-on outlets, including radial outlets and tangential outlets, shall have a minimum safety factor of 2.0 based on the rated working pressure rating.
- D. Proof of design testing for the Ductile Iron to Ductile Iron welding process shall, at a minimum, include a four-point bending test which places the weld bead in tension. The test sample shall be comprised of a beveled and butt welded coupon from which test strips are taken. These test strips of the welded Ductile Iron coupon shall be cut such that the weld bead is perpendicular to the longitudinal axis of the test strip. The test strip shall be fashioned such that the weld bead is located at the mid-point of a Talbot Strip test apparatus. The test strip shall demonstrate a minimum observed engineering stress of 80 ksi at failure. Additionally, this testing shall demonstrate a failure through the Ductile Iron pipe wall and not along a path defined by the heat affected zone of the weld. This testing shall be conducted in a manner similar to the Talbot Strip test method described in ANSI/AWWA C106/A21.6.
- E. After the outlets are welded together and prior to finishing, the assembly shall be subjected to a 15 psi air test for leakage. Any outlet failing this test shall be scrapped. No rework is allowed. Upon completion of this test, the outlet shall be

stamped to indicate it was successfully tested. Copies of all test reports shall be available for the owner upon request.

- F. The minimum Ductile Iron pipe thickness for fabrication of welded outlet pipe shall be Special Thickness Class 53.

2.22 PVC PIPING

- A. As-built/Locator pipe shall be 6" Polyvinyl Chloride (PVC) designed and manufactured in accordance with ASTM D-1785. Pipe shall be Schedule 80 under pavement and Schedule 40 outside pavement.

2.23 EROSION CONTROL MATS

- A. Erosion control mats for slopes and waterways shall comply with the requirements stated on the Contract Drawings.
- B. Turf reinforcement mat for slopes and water ways shall withstand a maximum velocity of 10 ft/s in an un-vegetative state, and 20 ft/s in a vegetative state. The mat shall be designed to be installed on a 1:1 or greater slope. The turf reinforcement mats shall be PYRAMAT High Performance Turf Reinforcement Mat produced by LANDLOK, Permanent Turf Reinforcement Mat produced by Vmax3, or approved equivalent material and manufacturer.

PART 3 – EXECUTION

3.01 CLEARING AND GRUBBING

- A. Where necessary, the construction zone will be cleared to allow trenching and pipe laying operations. Clearing will be restricted to easement limits shown on the plans. The cleared area shall be left free of stumps, limbs, rocks and other debris. Cleared areas in forested zones will be left in a condition suitable for bush-hog cutting; areas adjacent to lawns shall be left suitable for lawn mower cutting and at least in as good a condition as the adjoining property. Trees, brush, stumps and other debris from clearing and grubbing shall be disposed of in accordance with local ordinances (which place restrictions on burning); burial within the plant will not be permitted.
- B. The Contractor is responsible for restoring any property (shrubs, signs, sidewalks, paving, trees, structures, etc.) that is damaged by his operations.

3.02 PROTECTION OF TREES

- A. The Contractor shall carefully protect all trees adjacent to the work. Contractor shall not permit excavating machinery or trucks to scrape the bark or tear the limbs from the trees, nor connect ropes or guy cables to them.

3.03 INTERFERENCE WITH EXISTING STRUCTURES

- A. All existing pipes, drains, or other structures on, above, or below ground shall be carefully supported and protected from injury, and if injured, they shall be restored in a satisfactory manner by and at the expense of the Contractor.

3.04 INFORMATION CONCERNING CONDITIONS

- A. The accuracy of information furnished by the Engineer and/or the plans and specifications as to underground and surface structures, foundation conditions, character of soil, position and quantity of ground and subsoil water, etc., is not guaranteed by the Owner. Bidders must satisfy themselves by personal

examination and by such other means as they desire with respect to actual conditions in the nature of the ground and subsoil water and in regard to the locations of existing underground or surface structures. Unforeseen conditions shall not constitute a claim for increased compensation under the terms of the contract, nor constitute a basis for the cancellation thereof.

3.05 CLEAN UP

- A. The Contractor shall remove all unused material, excess rock and earth, and all other debris from the construction site as closely behind the work as practical. All trenches shall be backfilled and tamped before the end of each day's work.
- B. If at any time during the course of the work, the cleanup, grassing and/or pavement replacement falls too far behind the pipe laying (at the discretion of the Engineer) the Contractor shall be required to close down pipe laying operations until the cleanup, grassing and/or pavement replacement is caught up to the work in progress.

3.06 TRENCH EXCAVATION

- A. Water lines shall have a minimum cover of 48" and as shown on the drawings. Contractor shall follow the profile shown on the drawings, adjusted as necessary for unknown conflicts encountered during construction but must always provide a uniform slope up to air valves or down to blow-off valves without any intermediate high or low spots between these valves. All changes in grade shall be made gradually.
- B. In laying pipe across water courses or depressions of any kind, the minimum depth herein specified shall be maintained at the bottom of the depression.
- C. Where necessary, the line shall be lowered at valves so that the top of the valve stem is approximately one foot below the finished grade. The trench shall be deepened to provide a gradual approach to all low points of the line, and no additional payment shall be allowed for extra excavation involved.
- D. All trenches shall be of sufficient width to provide ample working space on each side of the pipe to allow making perfect joints and to allow taping of polyethylene encasement around the entire periphery of the pipe and bells at all joints.
- E. Pipe trenches shall be straight and true to grade and in the location shown on the plans. The bottom of trenches shall be dressed to facilitate laying conditions called for on the construction plans so that the pipe has an even bearing on bedding material throughout the entire length of the pipe barrel.
- F. Bedding shall be granular material and be 1/8 the nominal pipe diameter or 4" minimum under the pipe barrel. 84" steel pipe shall be supported by a minimum of 6" of bedding material. Crushed concrete or similar recycled material is not acceptable for use as bedding material. An earth dam shall be installed at 200-ft intervals to keep water from flowing easily through the gravel bedding.
- G. All excavation material shall be so placed so as not to interfere with travel on the areas along which the lines are laid. All excess excavated material shall be disposed of without extra cost to the Owner.

3.07 ROCK EXCAVATION

- A. All excavation is considered unclassified. There will be no additional payment for rock excavation. Unclassified excavation is defined as the excavation of all

materials encountered, including rock materials, regardless of their nature or the manner in which they are removed.

3.08 LAYING PIPE

- A. All pipe, before being placed in trench, shall be examined, and any pipe showing defects shall be rejected. The inside of the pipe shall be clean and free of trash and dirt, and if necessary a swab or brush shall be used to clean the pipe before lowering it into the trench.
- B. All pipe shall be laid straight, true to line and grade. For all laying conditions, bell and coupling holes shall be dug to allow the pipe to have continuous bearing with bedding throughout the entire length of the barrel between bell or coupling holes. No shimming or blocking up of the pipe will be allowed.
- C. In making ductile iron joints, the outside of the spigot end of the pipe and the inside of the bell shall be thoroughly cleaned and the gasket inspected to see that it is properly placed. Lubricant shall be applied to the spigot end of the pipe and it shall be inserted into the bell of the adjoining pipe to the "Stop Mark" shown on the pipe. Joint deflection shall be checked by Contractor for compliance with the pipe manufacturer's recommended limits.
- D. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Trench dewatering methods (gravel bedding with pumps, etc.) must be used where necessary to maintain a dry ditch during pipe laying operations.

3.09 BACKFILLING

- A. After the pipe has been installed and all joints have been made, the trench shall be backfilled as described on the detail sheets of the construction plans.
- B. Bedding shall be granular material and be 1/8 the nominal pipe diameter or 4" minimum under the pipe barrel, whichever is larger. 84" steel pipe shall be supported by a minimum of 6" of bedding material. Crushed concrete or similar recycled material is not acceptable for use as bedding material.
- C. Type 4 Bedding shall be used throughout the project.
- D. For the remaining backfill to the top of the trench, suitable material excavated from the site may be used, as determined by the Engineer, and compacted as shown in the trench details shown in the plans or as specified in Section 31 23 16, Excavation.
- E. Suitable material shall be clean and free of rock larger than 2" at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, debris or waste and other unsuitable materials.
- F. Should the material excavated from the trench be saturated, the saturated material may be used as backfill, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements.
- G. In rock excavation, the backfill shall not contain over 50% broken stone, and the maximum sized stone placed in the trench shall not have a weight exceeding 25 pounds. Excess rock and fragments of rock weighing more than 25 pounds shall be loaded and hauled to disposal as directed by the Engineer. If it is necessary, in order to comply with the above specifications, selected backfill shall be borrowed

and hauled to the trenches in rock excavation, at no additional cost to the Owner. Under no circumstances shall bottom of pipe rest against rock or unyielding material. Minimum bedding of 6" carefully compacted backfill shall separate bottom of pipe from rock or unyielding material.

- H. Tamping shall be done with mechanical tamps in such a manner as to meet compaction requirements without moving or damaging the pipe. Compaction shall be done with either pneumatic hand tamps, hydro-tamps or other approved methods.
- I. Compaction tests will be run as directed by Engineer to ensure that the above specifications are being met.

3.10 POLYETHYLENE ENCASEMENT

- A. Polyethylene encasement shall be **Double Wrapped** with 8-mil V-Bio white polyethylene encasement as the first and inside layer and with 8-mil (LLD) black polyethylene encasement in the second and outside layer. It shall be installed in accordance with AWWA C105 (ANSI A21.5-82) "Method A" (**Double Wrapped**).
- B. Cut polyethylene tube to a length approximately 2 ft. longer than that of the pipe section. Slip the tube around the pipe, centering it to provide a 1-ft. overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends.
- C. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube.
- D. After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe, and secure it in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make a snug, but not tight fit along the barrel of the pipe, securing the fold at quarter points.
- E. Repair any rips, punctures, or other damage to the polyethylene with manufacturer's adhesive tape or with a short length of polyethylene tube cut open, wrapped around the pipe, and secured in place. Proceed with installation of the next section of pipe in the same manner. If a second layer of polyethylene encasement is called on the plans, it shall be installed in the same manner as the first. The white or first layer shall not be visible anywhere along the pipe.
- F. Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.
- G. When valves, tees, crosses, and other odd-shaped pieces cannot be wrapped practically in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up and around the body. Make seams by bringing the edges together, folding over twice, and taping down. Handle width and overlaps at joints as described above. Tape polyethylene securely in place at valve-stem and other penetrations.
- H. Provide openings for branches, service taps, blow-offs, air valves, and similar appurtenances by making an X-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, tape the slack securely

to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene, with tape.

- I. Install polyethylene tubes on the carrier pipe (inside casings but not between the casing spacers and the pipe) by an X-shaped cut in the polyethylene and temporarily folding back the film. After the casing spacer is installed, tape the slack securely over and around the casing spacer appurtenances and repair the cut, as well as any other damaged areas in the polyethylene, with tape.

3.11 THRUST RESTRAINT

A. GENERAL

At changes in direction of the main and at other points shown on the plans or directed by the Engineer, thrust forces in the line shall be absorbed by restrained joints, concrete blocking, or reinforced concrete collars, or a combination thereof.

B. RESTRAINED JOINTS

Where restrained joints are called for on the construction plans, they shall be of the type specified in these specifications, and assembly shall be in accordance with manufacturer recommendations. Torque wrenches shall be used to verify that all bolts and nuts are tightened to manufacturer's recommendations.

C. CONCRETE BLOCKING

The Engineer shall be notified by the Contractor before blocking is placed. Blocking will be of the dimensions called for on the construction plans and will be placed against a vertical surface of undisturbed soil that has been cleared of all loose material.

D. REINFORCED CONCRETE COLLARS

Reinforced concrete collars shall be cast in place as shown on detailed plans and as specified in ACI 318-83.

3.12 LEAKAGE TEST

A. PRESSURIZATION

After the pipe has been installed, all new pipe shall be flushed and then subjected to a hydrostatic pressure test. Each valved section of pipe shall be slowly filled with water, and a test pressure of 1.5 times the working pressure for DIP and 1.2 times the rating of the pipe for steel pipe, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

If the Contractor intends to perform hydrostatic testing against existing valves that are in service, the Contractor must obtain permission from the Owner. Prior to testing, the Contractor shall disinfect the pipeline in accordance with the requirements of Paragraph 3.14. If, after repairs are made to the pipeline to correct leakage test deficiencies, the Engineer deems that the sanitation of the pipeline has been compromised, the Contractor shall disinfect the pipeline at the Contractor's expense.

B. AIR REMOVAL

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high point, the contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place at the discretion of the owner.

C. LEAKAGE DEFINED

Leakage shall be defined as the quantity of water that must be supplied into the newly installed pipe or any valved section thereof to maintain the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section.

Leakage shall be defined as the total quantity of water that must be pumped into the pipe during the test period to maintain pressure within 5 psi of the specified test pressure for the test duration including water required to return pipe to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

D. ALLOWABLE LEAKAGE

The allowable leakage rate will be in accordance with AWWA C600 and determined by the following formula:

$$L = (S \times D \times P^{1/2}) / 148,000$$

Where:

L = testing allowance (makeup water) in gallons per hour;

S = length of pipe tested, in feet;

D = nominal pipe diameter, in inches;

P = average test pressure during the test, in pounds per square inch.

For example, at an average pressure of 250 psi during the test, the leakage allowance is 2.14 gallons per hour for 1,000 feet of 20" pipe.

Any segment where leakage exceeds the allowable rate shall not be accepted; the leakage shall be located, repaired and re-tested until it meets the specified allowance.

E. TEST RESTRICTIONS

1. The hydrostatic test shall be of at least 2-hour duration. Test Pressure shall not vary by more than ± 5 psi for the duration of the test; this may require periodic pumping.
2. Valves shall not be operated in either direction at differential pressure exceeding the rated valve working pressure. Use of a test pressure greater than the rated valve pressure can result in trapped test pressure between the gate of a double-disc gate valve. For tests at these pressures, the test setup should include provision, independent of the valve, to reduce the line pressure to the rated valve pressure on completion of the test. The valve

can then be opened enough to equalize the trapped pressure with the line pressure, or fully opened if desired.

3. Test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

3.13 DISINFECTION

- A. After leakage testing and all necessary repairs have been made, the lines shall be flushed clean. Contractor must clean the pipe of all mud, sand, gravel, etc. as the pipe is installed. Cleaning of the pipe using high-pressure water jets or other means will be required as necessary to accomplish thorough cleaning. Contractor shall verify that cleaning has been accomplished by inspecting the interior of the pipe for the full length. Inspection of the pipe will be performed in the presence of the Engineer. After flushing the main, it will then be disinfected in strict accordance with AWWA Standard for Disinfecting Water Mains, C651- latest edition, subject to the following special conditions:
 - B. The method of disinfection shall be either the Continuous-Feed Method or the Slug Method. The Tablet Method is not acceptable.
 - C. The form of chlorine shall be a one percent solution made from sodium hypochlorite and pumped and metered into the pipeline. Water must be flowing during the feeding operation and the injection point must be located so that the flow of water will disperse the chlorine throughout the pipeline.
 - D. Unless otherwise approved by the Owner, Contractor shall dechlorinate the highly-chlorinated water being flushed from the pipeline.
 - E. The Owner shall be responsible for bacteriological sampling and testing water from the disinfected pipeline.
 - F. Before any flushing or disinfection work is begun, the Contractor shall outline his planned procedures for these tasks and obtain approval of the Owner.
 - G. The Contractor is responsible for the installation and removal of sample points as required by AWWA C651 on the water main.

3.14 DECHLORINATION

- A. After the disinfection process has been completed, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or is acceptable for domestic use. The area where the chlorinated water is to be discharged shall be inspected. If there is any possibility that the chlorinated discharge will cause damage to the environment, then ascorbic acid shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water.
- B. The chlorine residual of the water being disposed shall be neutralized by treating the water with ascorbic acid. Minimum dosage requirements are listed in the table below. Additional dosage for the complete neutralization of chlorine residual is the responsibility of the Contractor.

Chlorine	Ascorbic Acid
1 Lb	2.5 Lb

3.15 CONNECTION TO EXISTING WATER MAINS

- A. At beginning of construction, the Contractor shall make exploratory excavation at each location where connections to existing pipes are shown for the purpose of determining the exact location, elevation and type of fittings required to make the connections. Where it is necessary to disrupt service on existing lines, the Contractor shall first obtain permission from the Owner and schedule his work accordingly.

3.16 SETTING VALVES

- A. Valves shall be placed where shown on the plans or directed by the Engineer. Valves shall be set plumb, and shall have cast iron valve boxes and/or manholes as called for on the plans. The valve boxes shall be placed directly over the valve and set plumb, the top of the box being brought to the surface of the ground. After the boxes are in place, earth shall be filled in the trench and thoroughly tamped around the box, and after all settlement has taken place, each valve box shall have a concrete collar as shown on the plans.

3.17 VALVE STEM EXTENSION

- A. Valve stem extensions shall be furnished and installed for all buried gate valves and shall be 12" below grade for valves with valve boxes and 18" below the flat top of the valve vaults.

3.18 AIR AND VACUUM ASSEMBLIES

- A. Air and vacuum relief valve assemblies shall be constructed strictly in accordance with the details shown on the plans.

3.19 INSTALLATION OF SOLID SLEEVES

- A. Spacer rings must be used with all solid sleeves and no exceptions will be allowed. When connecting to existing water lines, one full length joint of pipe must be installed between solid sleeves and adapter pieces.

3.20 OUTLETS

- A. Where flanged outlets are shown on the plans, they shall be installed as recommended by the manufacturer.
- B. For welded-on outlets, in areas where the parent pipe is a restrained joint pipe and joined in the run to other restrained joints on both sides, it is important to fully extend the restrained joints (such as US Pipe's TR FLEX or American Flex-Ring) so that unwanted line extension does not over-deflect any joints attached to the welded-on outlet.

3.21 MEGALUG (WEDGE ACTION RESTRAINT GLAND)

- A. Contractor shall follow the manufacturer's instructions for installation of each Megalug.
- B. When installing the Megalug gland, clean the inside of the pipe bell and lubricate both the Megalug gasket and the spigot end of the pipe. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket. Insert the pipe into the pipe bell and press the gasket firmly and evenly into place. Keep the joint straight during assembly. Push the gland toward the pipe bell and center

it around the pipe with the gland lip against the gasket. Install bolts and hand tighten nuts. Make any required deflection after joint assembly and before the bolts are tightened. Tighten the bolts to the manufacturer's recommendation for the gland size. Contractor shall utilize a torque wrench to tighten the gland bolts and the t-bolts. At least one torque wrench shall be on the work site at all times. Tighten the twist-off bolts per manufacturer's recommendations. Should removal of this application be necessary, this must be done in accordance with manufacturer's recommendations.

- C. If restrained joints are installed above ground prior to installation in the underground trench, all connections shall be checked again after the pipe has been installed in the trench and the bolts checked for the correct torque. Polyethylene encasement shall be installed such that it does not interfere in this process.

3.22 SPECIALS AND FITTINGS

- A. Specials and fittings shall be properly braced to ensure that they will not be blown off or broken loose under the test pressure.

3.23 REMOVE & DISPOSE OF EXISTING APPURTENANCES

- A. Where called for on the plans, all existing above ground appurtenances shall be removed and disposed of by the contractor. The area where these appurtenances are removed shall be regraded and grassed or repaved to match the existing landscaping or pavement.

3.24 REMOVE AND DISPOSE OF EXISTING WATER MAIN

- A. Where called for on the plans, existing water main shall be removed and disposed of by the Contractor. The Contractor will be responsible for proper disposal of the existing water main off site.

3.25 REMOVING AND REPLACING PAVEMENT

A. GENERAL

Removing and replacing pavement bituminous or concrete shall consist of removing the type of pavement and base encountered and replacing same as shown on the detailed drawings. Pavement shall be removed only as necessary to install water main.

B. SUBGRADE

The trench shall be backfilled in layers not more than 6" thick and shall be thoroughly compacted with mechanical tamps. No base course shall be placed on loose earth or dusty material.

C. BITUMINOUS PAVEMENT

Bituminous pavement shall be replaced with base and topping as shown on drawings. Edges of cut pavement shall be neatly squared off. Extreme care shall be executed to assure that the squared edges of existing pavement will not be broken or disturbed during rolling of the asphalt topping.

3.26 REMOVE & REPLACE CONCRETE SIDEWALK

- A. Debris from sidewalks removed shall be collected and hauled away and disposed of by the Contractor in an approved disposal area. Sidewalks shall be replaced

with Portland Cement Concrete of not less than 3,000 psi compressive strength at 28 days of age. Sidewalks shall be replaced to the original width and thickness or a minimum of 6" thick. The sidewalks shall have a broom finish. All instructions in Placing of Concrete in these specifications shall be adhered to.

3.27 PIPE LOCATION

- A. The Contractor shall install 6" PVC pipe from the top of the water main to above grade at specific locations and maintain the pipe for the duration of the construction. The pipe shall be maintained clear of debris. During the survey for recording location of the pipe, the pipe shall be cut to a point below grade, backfilled with granular material and a locator ball installed as shown on plans.

3.28 RECORD INFORMATION

- A. The Contractor shall record on the manufacturer's pipe laying drawings the top of bell elevation for each joint of pipe installed in the format shown in the following table. Such drawings shall be submitted to the Engineer at the same time as the Contractor's monthly pay request is submitted.

Point #	Station #	Top of Pipe Elev.	Description

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SECTION 33 11 36

SAMPLE PUMPS

PART 1 – GENERAL

1.01 DESCRIPTION

Provide all labor, materials and equipment required to install, test and put in operation, sample pumps and appurtenances as indicated on the drawings and as specified herein.

1.02. SUBMITTALS

A. Submit the following in accordance with Section 01 33 00:

1. Shop Drawings.
2. Manufacturer data.

B. Submit Operation and Maintenance Manuals in accordance with Section 01 78 23.

1.03 DELIVERY, STORAGE AND PROTECTION

In accordance with Section 01 61 00 and Section 01 62 00.

1.04 WARRANTY

Provide in accordance with Section 01 78 36.

1.05 SPECIAL REQUIREMENTS

A. A single manufacturer shall assume unit responsibility for all items specified in this technical section. Unit responsibility shall require that all items be products of, or guaranteed by, the manufacturer. The manufacturer shall be responsible for all coordination between components and provide all submittals, installation and start-up assistance and certifications on the equipment as a unit.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Grundfos, Clovis, CA – Model Redi-Flo 3" 5SQE-90
- B. Goulds, Seneca Falls, NY – model equivalent to Grundfos pump (if available)
- C. Or approved equal.

2.02 SERVICE CONDITIONS

- A. Provide centrifugal submersible pumps.

B. Performance Requirements:

Location	Clearwell #3 Inlet (Influent)	Clearwell #3 Exit (Effluent)
Pump Designation	P-606	P-608
Sample Description	Finished Water	Finished Water
Design Capacity	5 gpm	5 gpm
Design TDH	86 feet	86 feet
Horsepower	1/3 HP	1/3 HP

2.03 FABRICATION AND MANUFACTURE

- A. The pump shall be suitable for continuous operation and shall be provided with an electronically controlled permanent-magnet motor.
- B. The pump shall be provided with a CU300 control unit and an SPP 1 potentiometer to manually control the speed.
- C. The materials of construction of the pump shall be as shown in the following table.

COMPONENT	SPLINED SHAFT
Valve Casing	Polyamide
Discharge Chamber	304 Stainless Steel
Valve Guide	Polyamide
Valve Spring	316LN Stainless Steel
Valve Cone	Polyamide
Valve Seat	NBR Rubber
O-ring	NBR Rubber
Lock ring	310 Stainless Steel
Top Bearing	NBR Rubber
Top Chamber	Polyamide
Guide Vanes	Polyamide
Impeller	Polyamide w/tungsten carbide bearings
Bottom Chamber	Polyamide
Neck Ring	Polyamide
Bearing	Ceramic
Suction Interconnector	Polyamide
Ring	304 Stainless Steel
Pump Sleeve	304 Stainless Steel
Cone for pressure equalization	Polyamide
Spacer	Polyamide

Sand Trap	316 Stainless Steel
Shaft w/coupling	304 Stainless Steel
Cable Guard	304 Stainless Steel

- D. Dry-Run Protection - the pump shall incorporate integrated Dry-Run protection. When the water level falls below the inlet of the pump, the pump will shut off. After a period of time, the pump will then automatically start up again. The cut-off level will be set by using the CU300 control unit.
- E. Overtemperature Protection – the motor shall be provided with an internal circulation system to effectively cool all the internal motor components. As extra protection, the electronic unit shall also include a built-in temperature sensor. When the temperature rises too high, the motor will shut off; when the temperature drops, the motor will automatically restart.

2.04 SHOP TESTING (not used)

2.05 SHOP PAINTING

Surface preparation and shop priming shall be compatible with the final painting system as specified in Section 09 91 00 of these specifications.

2.06 SPARE PARTS

Furnish one spare pump with motor for each location (total of 2 pumps). Tag each pump with the Pump Designation and Sample Description shown in the table in section 2.02 B. Spare pumps will be stored at the plant for replacement as needed. Spare control units are not required.

PART 3 – EXECUTION

3.01 INSTALLATION AND OPERATION AND MAINTENANCE MANUAL

Install in accordance with manufacturer’s instructions and provide operation and maintenance manual in accordance with Section 01 78 23 of these Specifications.

3.02 FIELD PAINTING

In accordance with Section 09 91 00 of these Specifications.

3.03 FIELD TESTING

The Contractor shall perform field testing of the equipment to demonstrate that the pumps and controls operate as specified in this Section. The Contractor shall demonstrate all control features of the equipment.

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SECTION 33 41 01

STORM DRAIN PIPING

PART 1 – GENERAL

1.01 SCOPE

Work covered in this section shall include furnishing and laying precast concrete pipe or corrugated metal pipe as called for on the drawings and specified, including trench excavation and backfill.

1.02 QUALITY ASSURANCE

- A. Each length of pipe shall be inspected by an independent commercial testing laboratory acceptable to the Engineer prior to delivery. Each joint of pipe shall be stenciled or otherwise clearly and legibly marked with the laboratory's mark of acceptance.
- B. Each pipe shall be clearly marked as required by the governing ASTM standard specifications to show its class or gauge, date of manufacture, and the name of trademark of the manufacturer. Elliptical reinforced concrete pipe shall be clearly marked top and bottom and the minor axis clearly noted on the interior surface of the pipe.
- C. Any pipe which have been broken, cracked, or otherwise damaged before or after delivery or which have failed to meet the required tests shall be removed from the site of the work and shall not be used therein.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Pipe shall be furnished in sizes, types, and classes at the locations shown on the drawings, and/or specified herein. Pipe thickness or class shall, as a minimum, meet the requirements of GA DOT Standard 1030D for the depth of cover at the installed location.
- B. All pipe shall be of all new materials which have not been previously used.

2.02 CORRUGATED METAL DRAINAGE STRUCTURES

- A. Corrugated metal drainage structure material shall conform to the latest revision of AASHTO M36, M274, M196, M167, or M219.
- B. Corrugated metal drainage structures for applications which are to be bituminous coated shall conform to AASHTO M190.

2.03 CONCRETE PIPE

- A. Concrete pipe 12 inches and larger in diameter shall be reinforced concrete culvert, storm drain and sewer pipe conforming to the latest revisions of ASTM C 76.

- B. Reinforced concrete pipe shall be centrifugally cast or vibrated prebed, horizontally or vertically cast, or made on a Packerhead machine and shall be furnished in lengths not less than 4 feet.
- C. Reinforced concrete pipe shall have circumferential reinforcement as required for the particular class of pipe furnished.
- D. Reinforced concrete pipe shall have tongue and groove joints sealed with an approved preformed flexible joint sealant.

2.04 JOINT MATERIALS

- A. Joint material for tongue and groove concrete pipe shall be cold-applied plastic gaskets meeting the requirement of AASHTO M198, Type B.
- B. Joints for corrugated metal drainage structures shall be the standard type single piece corrugated coupling bands fabricated of the same material as the drainage structure. The minimum band length shall be 12 inches. Coupling bands shall be fabricated according to AASHTO MI 90; or AREA Volume 1, Chapter 1, Part 4 for railroad applications.

2.05 BEDDING

- A. Bedding for concrete and corrugated metal pipe shall be a minimum of Type 4, as shown on the drawings.

PART 3 – EXECUTION

3.01 EXCAVATION

Excavation shall be performed in accordance with the sections entitled "Earthwork" of these detailed specifications.

3.02 PIPE LAYING

- A. Immediately prior to laying the pipe, all projections or irregularities which will prevent the joints from closing properly shall be removed.
- B. Pipe shall be laid true to line and grade on a bed which is uniformly firm throughout its entire length. If material in the bottom of the excavation is of such character as to cause unequal settlement along the length of the storm sewer or culvert, the material shall be removed below the grade given, to such depth as required and shall be backfilled with granular bedding material and thoroughly tamped or otherwise compacted to ensure an unyielding foundation. Pipe shall not be laid upon frozen ground.
- C. Pipe, unless otherwise provided or directed by the Engineer, shall be laid beginning at the lower end and with the bells or receiving ends up grade. The spigot or tongue end shall be inserted into hub or receiving end as far as construction of the pipe will permit.
- D. The pipe shall be protected from water during placing, and until the material in the joints has thoroughly set.
- E. Ends of the pipe shall be rigidly supported to prevent any movement pending which might occur during the construction of end supports.

- F. Any pipe which is not in true alignment or which shows any settlement after laying, or is damaged, shall be taken up and relaid at the Contractor's expense.

3.03 FILLING AROUND AND OVER STORM SEWERS AND PIPE CULVERTS

- A. When storm sewers or pipe culverts are placed under the roadway proper, granular backfill material will be thoroughly compacted under the haunches of the pipe. If the ditch is dry and the width permits, use dry granular soil; otherwise use graded aggregate. Compaction of backfill material shall be compacted by means of mechanical tampers. The remaining portion of the trench shall be filled in 6-inch lifts with suitable backfill material. Each lift shall be compacted with mechanical tampers. Backfill within the segment of pipes under roadways shall be compacted to 95 percent of maximum density.
- B. Backfill for the pipe must be placed in a dry trench, and any water encountered in ditches, springs, etc., shall be considered a necessary part of construction and shall be handled by pumping, ditching, or any other method satisfactory to the Engineer.

3.04 CLEANUP

After completing each section of the storm sewer or culvert, the Contractor shall remove all debris and construction materials and equipment from the site of the work, grade and smooth over the surface on both sides of the line and leave the entire right-of-way in a clean, neat, and serviceable condition.

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SECTION 33 44 13.13

CATCH BASINS

PART 1 – GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Welding Society (AWS): Code for Welding in Building Construction.
 2. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A48, Standard Specification for Gray Iron Castings.
 - c. A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - d. C94/C94M, Standard Specification for Ready-Mixed Concrete.
 - e. C387, Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - f. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.

PART 2 – PRODUCTS

2.01 CONCRETE

- A. Concrete shall be ready-mixed, conforming to ASTM C94/C94M, Alternate 2. Compressive field strength shall be not less than 2,500 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inch. Slump shall be between 2 and 4 inches. Field strength shall be assumed as equal to 85 percent of strength of laboratory-cured cylinders.

2.02 FORMS

- A. Exposed surfaces shall be plywood. Others shall be steel, matched boards, plywood, or other acceptable material. Form vertical surfaces. Provide fillets on re-entrant angles. Trench walls, large rock, or earth will not be acceptable form material.

2.03 REINFORCING STEEL

- A. Reinforcing steel shall conform to ASTM A615/A615M, Grade 60, deformed bars.

2.04 PRECAST UNITS

- A. At the option of Contractor, approved precast units may be substituted for cast-in-place units. Precast units shall conform to ASTM. Submit details of proposed units to Engineer for review. Concrete risers for extensions shall be a

maximum of 6 inches high and of same quality as sections. Risers shall be reviewed by Engineer before installation.

2.05 MORTAR

- A. Standard premixed mortar conforming to ASTM C387, Type S, or proportion 1 part portland cement to 2 parts clean, well-graded sand which will pass a 1/8-inch screen. Admixtures may be used not exceeding the following percentages of weight of cement: Hydrated lime, 10 percent; diatomaceous earth or other inert materials, 5 percent. Consistency of mortar shall be such that it will readily adhere to concrete.

2.06 FRAMES AND GRATINGS

- A. Cast iron frames and gratings for catch basins and storm drain inlets shall be as indicated. Bearing surfaces shall be clean and shall provide uniform contact. Castings shall be tough, close-grained gray iron, sound, smooth, clean, free from blisters, blowholes, shrinkage, cold shuts, and defects, and shall conform to ASTM A48, Class 30.

PART 3 – EXECUTION

3.01 EXCAVATION AND BACKFILL

- A. Excavate as required to accomplish construction. Backfill shall be as specified for adjoining pipe trench.

3.02 CONSTRUCTION OF CATCH BASINS AND INLETS

- A. Construct inlets and catch basins at locations shown and in accordance with Drawings. Construct forms to dimensions and elevations required. Forms shall be tight and well braced. Chamfer corners of forms.
- B. Prior to placing concrete, remove water and debris from forms. Moisten forms just prior to placing concrete. Handle concrete from transporting vehicle to forms in a continuous manner as rapidly as practical without segregation or loss of ingredients. Immediately after placing, compact concrete with mechanical vibrator. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.
- C. Screed top surface of exposed slabs and walls. When initial water has been absorbed, float surfaces with wood float and lightly trowel with steel trowel to smooth finish free from marks or irregularities. Finish exposed edges with steel edging tool. Remove forms and patch defects in concrete with mortar mixed in same proportions as original concrete mix.
- D. Cure concrete by preventing loss of moisture for a period of 7 days. Accomplish with a membrane-forming curing compound. Apply curing compound immediately after removal of forms or finishing of slabs. Protect concrete from damage during 7-day curing period.

3.03 PLACING PRECAST UNITS

- A. If material in bottom of trench is unsuitable for supporting unit, excavate and backfill to required grade with 3-inch minus, clean, pit-run material. Set units to grade at locations shown.

3.04 EXTENSIONS

- A. Install extensions to height determined by Engineer. Lay risers in mortar with sides plumb and tops to grade. Joints shall be sealed with mortar, with interior and exterior troweled smooth. Prevent mortar from drying out and cure by applying a curing compound. Extensions shall be watertight.

3.05 INSTALLATION OF FRAMES AND GRATES

- A. Set frames and grates at elevations indicated or as determined in field and in conformance with Drawings.
- B. Frames may be cast in, or shall be set in mortar.

3.06 CLEANING

- A. Upon completion, clean each structure of all silt, debris, and foreign matter.

- END OF SECTION -

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SECTION 40 05 65

SMALL VALVES AND APPURTENANCES

PART 1 – GENERAL

1.01 SCOPE

- A. Furnish all labor, materials, equipment and incidentals required to complete and make ready for operation, all valves and appurtenances as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

- A. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval. Clearly indicate make, model, location, type, size and pressure rating.
- B. The manufacturer shall provide written certification to the Engineer that all equipment furnished complies with all applicable requirements of these Specifications.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide valves of same manufacturer throughout, where possible.
- B. Provide valves with manufacturer's name and pressure rating clearly marked on a stainless steel nameplate on the outside of the valve body.
- C. All exposed bolts, nuts, and washers shall be stainless steel.

2.02 PRESSURE GAUGE

Pressure gauge shall be 304 stainless steel material and 316 stainless steel tube and socket with a minimum 2½ -inch dial face, dry filled, with a pointer indicator capable of displaying true zero without the use of a stop pin and ASME Grade 1A with 1% accuracy at full scale. Pressure gauge shall be manufactured by Ashcroft, Type 1009 Stainless Steel Case Gauge, or approved equal. The pressure gauge shall be equipped with a pressure snubber of suitable material and diaphragm seal supplied by the pressure gauge manufacturer Ashcroft, Type 315, All-Welded "Mini" Diaphragm Seal with pressure connection.

2.03 NEEDLE VALVES

Valves ¾-inch and smaller shall be PVC Cell Class 12454 per ASTM D1784 with heavy duty FPM O-ring seals and integrated stem/PTFE seat design, and be Hayward NVA Series or approved equal.

2.04 BALL VALVES (NON-METALLIC)

Valves ¾-inch and smaller shall be full-port design, PVC Cell Class 12454 per ASTM D1784 with heavy duty FPM O-ring seals and PTFE seat design, and be Hayward TB Series or approved equal.

2.05 BALL VALVES (METALLIC)

Valves 3/4-inch and smaller shall be full-port design, A351-CF8M stainless steel body with seal and 316 stainless steel ball, SS Tee Handle and nut, and be Apollo 76-100 Series or approved equal.

2.06 PRESSURE REGULATING VALVES

Valves 3/4-inch and smaller shall have an integrally molded threaded gauge port and be made of PVC Cell Class 12454 per ASTM D1784 with heavy duty FPM O-ring seals, and be Hayward PR Series or approved equal.

2.07 BACK PRESSURE VALVES

Valves 3/4-inch and smaller shall have an integrally molded threaded gauge port and be made of PVC Cell Class 12454 per ASTM D1784 with PTFE/FPM diaphragm, Noryl™ molded dome, 304 stainless steel bolting, anti-siphon function, adjustment screw with slot, and be Hayward PBV Series or approved equal.

2.08 ROTAMETER

Meter shall be tough-machined acrylic body with 316 stainless steel guide rod, highly polished clear finish, easy-to-read direct reading dual scale (GPM/LPM), with scale length of 4", white back reflector for easy reading, F/NPT Adapters with high grade Viton7 O-Ring Seals, and aluminum "stress ring" thread supports. Meter shall be Dakota Instruments 6B41 or approved equal.

PART 3 – EXECUTION

3.01 INSTALLATION

All valves and appurtenances shall be installed in the locations shown on the Drawings, true to alignment and properly supported in accordance with the manufacturer's recommendations.

3.02 FIELD PAINTING

All exposed valves and appurtenances specified herein shall be painted as part of the work in Section 09 91 00 of these Specifications.

- END OF SECTION -

SECTION 40 27 02

BUTTERFLY VALVES

PART 1 – GENERAL

1.01 SCOPE

- A. Reference Section 33 05 24 Steel Pipe.

PART 2 – PRODUCTS

2.01 BUTTERFLY VALVES

- A. Butterfly valves (water service) shall be of the rubber-seated, tight-closing type conforming to the latest revision of AWWA C504 Specifications. The manufacturer shall have a minimum of 10 years of experience in manufacturing butterfly valves of the sizes required in accordance with AWWA C504 Specifications. All butterfly valves shall be the product of one manufacturer. Butterfly valves shall be as manufactured by, DeZurik, Pratt, or Val-Matic. No substitutions are allowed. Each valve shall be performance and leak tested as specified in AWWA C504 revised as follows: In addition to the testing requirements of AWWA C504, each butterfly valve shall be thoroughly cleaned and opened and closed at least three (3) times prior to testing. Certified copies of the test results shall be submitted to the Engineer for approval prior to shipment of the valve.
- B. Butterfly valves shall be Class 150B, unless otherwise indicated in the valve schedules, and of the short body design with flanged ends, as shown on the Drawings.
- C. Valve bodies shall be epoxy coated ductile iron conforming to ASTM A-126, Grade B, ASTM A-48, Class 40 or Ductile Iron ASTM A536, Grade 65-45-12. Where required to meet design operating conditions, valve bodies shall be manufactured of higher strength materials. Valve bodies shall have integral hubs for housing shaft bearings and seals.
- D. Butterfly valves shall be of the concentric or eccentric shaft types. Valve discs shall be constructed of epoxy coated ductile iron, ASTM A536, Grade 65-45-12. Disks shall be of the "offset" design to provide a full 360-degree seating surface with no external ribs transverse to flow and shall comply with the latest revision of AWWA C504 Specifications. The valve manufacturer shall furnish Shop Drawings which include end clearance dimensions when the disc is in the full open position.
- E. The resilient valve seat shall be synthetic rubber designed to seat against a pressure differential of 150 psi on either side of the valve, unless otherwise indicated. The resilient seat shall be mechanically attached to the valve disc or valve body. Any required seat attachment hardware shall be stainless steel. The resilient seat shall be capable of being adjusted or replaced in the field without moving the valve disc along the shaft axis or removing the valve from the line. The mating seat surface shall be stainless steel or monel.

The seats shall be factory tested as per AWWA C504 at a test pressure of 150 psig, unless otherwise indicated, and post adjusted for differential pressures indicated herein.

- F. Valve shafts shall be one-piece or two-piece units of stainless steel construction suitably sized to transmit the torques required to operate the valves under the conditions listed in the valve schedule with appropriate safety factor. Shafts shall be securely attached to valve disc by means of conservatively sized corrosion-resistant taper pins, threaded at one end and secured with lockwashers and nuts (i.e.: mechanically attached). Provide O-ring seal on taper pin if required to prevent leakage. Shaft key shall be constructed of corrosion-resistant material.
- G. Shaft bearings shall be contained in the integral hubs of the valve body and shall be the permanently self-lubricated, corrosion resistant, sleeve type of teflon or heavy-duty bronze. The valve assembly shall be furnished with a factory set two-way thrust bearing designed to center the valve disc in the valve seat at all times. End cover bolts shall be of stainless steel construction.
- H. The shaft seal shall be pull down packing type. It shall be self-adjusting, self-compensating type. Packing shall be as manufactured by Chevron, or approved equal. Butterfly valves shall be designed with an extension bonnet so that repacking can be done without removal of the actuator. For buried valves the packing gland cover assembly shall be heavy duty, soil and water resistant. Stuffing boxes for pull down packing shall have a depth sufficient to accept at least 4 rings of self-compensating type packing specifically selected for the operating pressures to be encountered. Stuffing box bolts, nuts, and studs shall be stainless steel.
- I. The "O" ring type shaft seal shall be contained in a removable bronze cartridge. The bronze cartridge shall be manufactured from ASTM B505 copper alloy UNS #C93200 and shall meet the requirements of AWWA C504 for bronze, Grade E. The "O" ring material shall be nitrile, BUNA-N rubber, as intended for use with potable water or wastewater and per ASTM D-2000 with a hardness of 70 Shore A Durometer.
- J. Valves shall be supplied with torque tube type shaft extensions (bonnets) that support the actuator as shown on the Drawings. Each torque tube shall be sized to operate under the maximum service conditions for the valve. The torque tube shall be sized to transmit the required torque to the valve while limiting the torsional deflection to no more than 2 degrees at the seating position. Disc stops shall be used to eliminate the effects of torsion twist. Lengths of the torque tubes shall be based on the dimensions shown on the Drawings. The torque tube shall be connected to the valve shaft with a taper pin and nut or with a keyed connection. Torque tubes shall have threaded holes in the top suitable for lifting eyes sized for the weight of the torque tube when lifted at a 90-degree angle.
- K. Manual operators for butterfly valves 18-inches in diameter or larger shall be the worm gear type conforming to AWWA C504. Manual operators for butterfly valves mounted above 6 feet from the operating floor shall be equipped with worm gear chainwheel actuators. Operators shall be equipped with adjustable AWWA limit stops, shall be sized according to Table IV for Class 150B, and shall require a minimum of 15 turns for 90 degrees or full stem valve travel. The capacity of the manual operator shall be adequate to drive the valve under the differential pressure of 150 psi and maximum anticipated flow, unless otherwise indicated in the appropriate valve schedule.
- L. The manufacturer shall certify that the butterfly valves are capable of operating in continuous duty service under these pressures and flow conditions.

- M. Each valve shall be hydrostatically tested and tested for bubble tightness after the operator has been mounted and adjusted. Copies of the hydrostatic and leakage test certification and certification of conformance shall be submitted to the Engineer prior to shipment.
- N. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall have baked-on fusion bonded epoxy. Sprayed-on coats shall not be allowed. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.
- O. The valve body shall be of sufficient stiffness to provide leak-tight integrity of the valve when mounted in horizontal or vertical pipelines. When mounted in a horizontal pipe, the following shall apply. The stiffness of the body section including the flanges shall be sufficient to prevent a radial deflection exceeding 0.060 in. (1.52 mm) without soil or bedding support when subject to static loading from the weight of the actuator, the weight of the valve, the weight of the fluid in the valve, and an external distributed vertical load of 5 psi (35 kPa) on the projected area of the body unless otherwise specified. Valve shall be furnished with Class D flanges.

PART 3 – EXECUTION (NOT USED)

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SECTION 40 90 00

INSTRUMENTATION, CONTROL AND MONITORING
SYSTEM GENERAL REQUIREMENTS

PART 1 - GENERAL REQUIREMENTS

1.01 SCOPE

- A. Requirements: This Section covers the general requirements for furnishing and installation of the instrumentation, control and monitoring (ICM) system complete in every detail for the purposes specified. The other Sections of this Division shall supplement this Section as necessary.

1. Work Included

- a. The intent of Division 40 is to require that the complete Instrumentation, Control and Monitoring System shall be furnished by a single Control Systems Integrator (CSI) to assure system uniformity, subsystem compatibility and coordination of system interfaces.
 - b. Provide a complete and functional Supervisory Control and Data Acquisition (SCADA) system as described herein, as per the Contract Documents, and as shown on the Contract Drawings. The existing SCADA system shall be modified as required to monitor and control equipment and devices shown on the Contract Drawings at Wyckoff Water Treatment Plant with communication to the existing SCADA system; all equipment, materials, incidentals, software, supervision, and labor shall be provided under this Contract.
 - c. Furnish the tools, equipment, materials, and supplies and perform the labor required to complete the furnishing and installation of, including instrumentation signal and power conduit and wiring not specifically shown on the electrical drawings, validation, start-up and operational testing of a complete and operable ICM system as indicated on the Contract Drawings and as specified herein.
 - d. Provide the equipment components, interconnections and the services of the manufacturers' engineering representatives for the engineering, implementation, startup, operation, and instruction, to ensure that the Owner receives an integrated and operational ICM system as herein specified.
 - e. Coordinate with the requirements of Division 26 – Electrical, and provide for operator restart of all equipment on restoration of loss-of-power condition. Sequence automatically equipment restart and provide for time delays as necessary to prevent breaker trips on inrush from multiple equipment concurrent starting.
2. As a minimum, the CSI shall perform the following work:
- a. Implementation of the ICM system:
 - i. Prepare shop drawing submittals.
 - ii. Design, develop, and electronically draft loop drawings and control panel designs.

- iii. Prepare the test plan, the training plan, and the spare parts submittals.
 - iv. Procure hardware.
 - v. Fabricate panels.
 - vi. Program the ICM system as shown on the Contract Drawings.
 - vii. Perform factory tests on panels.
 - viii. Perform bench calibration and verify calibration after installation.
 - ix. Oversee and certify installation.
 - x. Oversee, document, and certify loop testing.
 - xi. Oversee, document, and certify system commissioning.
 - xii. Conduct the performance test.
 - xiii. Prepare operations and maintenance manuals.
 - xiv. Conduct training classes.
 - xv. Prepare record drawings.
 - xvi. Prepare calibration sheets.
 - xvii. Certify the installation of the ICM system.
- b. Integration of the ICM system with instrumentation and control devices being provided under other Sections:
 - i. Develop all requisite loop drawings and record loop drawings associated with equipment provided under other Divisions and Owner equipment.
 - ii. Resolve signal, power, or functional incompatibilities between the ICM system and interfacing devices.
 - c. CSI shall document with bid if there are any exceptions taken to the specifications.
3. Work Not Included
- a. Process piping, installation of in-line instrumentation, i.e., final control elements in process pipelines, air compressors, main air supply headers, and mechanical work as specified in other Divisions.
 - b. Electrical power distribution specifically included under Division 26, circuit protection devices, power conduit and wiring indicated, local equipment control stations, and miscellaneous electrical requirements as specified in Division 26.

B. System Responsibility

- 1. The ICM system as specified in Division 40 is an integrated system and therefore shall be provided by a competent, qualified CSI who shall have total responsibility for the Work of Division 40. Entire system installation including calibration, validation, start-up, operational testing, and training shall be performed by qualified personnel, possessing all the necessary equipment and who have had experience performing similar installations. The System shall be integrated using the CSI's latest, most modern proven design and shall, as far as practical, be by one manufacturer.

2. The Contractor shall perform the Work under this Division 40, through the use of a qualified CSI who shall perform said Work but it shall be understood that this shall not relieve the Contractor from any responsibility under the Contract.
3. The Contractor shall be responsible for the correct installation of all hardware and systems specified in Division 40.
4. The Contractor shall be responsible to see that all instrumentation components of other Divisions, including primary measuring, indicating, transmitting, receiving, recording, totalizing, controlling, alarming devices and appurtenances are compatible and shall function as outlined, and he shall furnish and install such additional equipment, accessories and appurtenances as are necessary to meet these objectives at no additional cost to the Owner.
5. The Contractor shall use the instrument tag and equipment numbering scheme as shown in Contract Documents, for identifying components which are part of this system.
6. Due to the complexities associated with the interfacing of numerous control system devices, the CSI or vendor shall be responsible to the Contractor for the integration of the ICM system with existing devices and devices provided under other Divisions and provide a completely-integrated control system free of signal incompatibilities; this includes providing review and comment to other vendor equipment submittals and overall coordination of the system.

C. Certification of Intent:

1. Fifteen days after notice to proceed, the Contractor shall submit a certification from the selected CSI. The certification shall be typed on letterhead paper of the CSI. The certification shall be signed by an authorized representative of the CSI. The certification shall include the following statements:
 - a. (Company name) "hereby certifies intent to assume and execute full responsibility to the Contractor to perform all tasks defined under Paragraph 1.01 Scope, in full compliance with the requirements of the Contract Documents."
 - b. "It is certified that the quotation to the Contractor includes full and complete compliance with the requirements of the Contract Documents without exception."

D. Documentation of Instrumentation Subcontractor Qualifications:

1. General
 - a. The entire control system installation including panel building, calibration, validation, start-up, operational testing, and training shall be performed by a control systems integrator (CSI) staffed with qualified personnel, possessing necessary equipment and experience in performing similar installations.
 - b. The system shall be integrated using the latest, most modern proven design and shall, as far as practical, be of one manufacturer.
 - c. The equipment, level of detail, and overall quality of the control system shall be consistent a typical industrial type control system.
 - d. Overall system performance shall be guaranteed.

- e. Software packages shall be latest versions available.
- 2. Systems house qualifications:
 - a. Where a systems' house other than the systems listed below is proposed by the contractor, the proposed systems house shall be approved by the owner prior to the bid.
 - b. The systems house will be evaluated based on the evidence of experience requirements described below.
 - c. The following systems house is pre-qualified to perform the control system work described in Division 40 without the need to submit evidence of experience:
 - i. M/R Systems, Norcross, Georgia
 - d. If the contractor submits a non-prequalified CSI, and during the project it becomes apparent to the owner that the CSI does not have the staff, skills, or experience to provide the quality of work expected, then the contractor is responsible to replace them with one of the prequalified CSIs. This will then require the contractor to have the new CSI review all previous work and submittals, and bring them up to the required standards. This shall be done at the Contractor's own expense without the Owner incurring any additional charges.

E. Contract Drawings

- 1. Information on the Drawings
 - a. The following information relative to the Work of Division 40 is indicated on the Division 26 Contract Drawings.
 - i. Location of primary elements, control panels, and final control elements.
 - ii. Instrumentation signal and power conduit runs between control panels and field instruments and devices.
 - iii. Quantity and sizes of instrumentation conductors and cables are indicated on the drawings but shall be verified by the Contractor.
 - iv. Location of all equipment having alarm and equipment status contacts.
 - v. Major instrument conduit runs.
- 2. Information Not on the Drawings
 - a. The following information relative to the Work of Division 40 may not be shown on the Drawings but shall be the responsibility of the Contractor to determine, furnish, coordinate with other Trades, and submit for approval, based upon the systems specified.
 - i. Tubing for pneumatic signals, and/or power between main headers and control panels, field mounted primary elements, field instruments and final control elements.
 - ii. Number or sizes of tubing required for pneumatic and hydraulic signals.
 - iii. Point of connection to any hydraulic or pneumatic supply lines.

F. Related Sections include but are not necessarily limited to:

1. Section 40 90 01 – ICMS Testing Requirements.
2. Section 26 00 00 – General Electrical Requirements.
3. Section 26 05 26 – Grounding and Bonding.
4. Section 26 05 33 – Conduit.
5. Section 26 05 05 – Wire and Cable (600V).
6. Section 26 33 53 – Static Uninterruptible Power Supply.

1.02 REFERENCES

A. Publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by basic designations only.

1. Instrument Society of American (ISA).
 - a. ISA S5.4 – Instrument Loop Diagrams.
2. National Electrical Manufacturers Associations (NEMA).
 - a. NEMA – Electrical Code.
3. American Standard Code for Information Interchange (ASCII).
4. Institute of Electrical and Electronic Engineers (IEEE).
 - a. IEEE C62.41 – Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits.

1.03 SUBMITTALS

A. General.

1. Refer to the General Conditions of the Contract Documents for required method of preparation and transmittal and conform to requirements herein.
2. Incomplete submittals will be rejected and shall not extend required submittal deadlines.
3. Contractor shall include CSI submittals and other action items in the project schedule and critical path.
4. The expected submittal deliverables shall include but shall not be limited to:
 - a. Control Panels Exterior and Interior Layouts
 - b. Detailed Bill of Materials
 - c. Control Panels Schematic and Interconnection Wiring Diagrams
 - d. Control Panels 3D Models
 - e. Control Narrative
 - f. SCADA and PanelView Graphics

- g. PLC and HMI Programs
- h. Catalog cut sheets with clearly identified Model numbers.
- i. Modifications to the existing control panels.

B. Shop Drawings

Before proceeding with any manufacturing, submit Shop Drawings for approval in complete bound sets indexed by specification number. Describe the items being submitted. Manufacturer's specification or data sheets shall be clearly marked to delineate the options or styles to be furnished. Submit only complete systems, not pieces of equipment from various systems. Show dimensions, physical configurations, methods of connecting instruments together, mounting details, and wiring schematics. Schematics shall be complete with tag and terminal numbers. Submit fabrication drawings, nameplate legends, and control panel internal wiring and piping schematic drawings clearly showing equipment and tag numbers on panels. Submit panel graphic drawings where applicable. Include material specifications lists where applicable. Include a draft of the theory of operation for relay logic circuits including those implemented via programmable controllers. Submit detailed field instrument installation drawings for each instrument.

C. Design Related Submittals

1. Provide the following submittals:

a. Catalog Cuts

- i. Catalog information, descriptive literature, wiring diagrams, and shop drawings shall be provided for all devices, whether electrical or mechanical, furnished under Division 40. This includes, but is not limited to, primary elements, transmitters, analytical equipment, gauges, valves, controllers, indicators, power supplies, switches, lights, relays, timers, etc.

2. Component Data Sheets

- a. Data sheets, specification sheets, and an instrument list shall be provided for components provided under this Section. The purpose of this material is to supplement the generalized catalog information by providing the specifics of each component (e.g., part numbers, scales, ranges, service, materials of construction, component location, options, and the individual tag number as noted in the Contract Drawings and in Contract Documents.
- b. Include such other necessary data as would provide a complete and adequate specification for reordering an exact duplicate of the original item from the manufacturer at some future date. More than one tag numbered item may be included on a sheet.
- c. Component ISA tags shall be used in the control narrative, schematics, and other submittal documents.

3. Sizing Calculations

- a. Complete sizing calculations shall be provided for all flow elements. The calculations shall include the process data used, minimum and maximum values, permanent head loss and all assumptions made. Equations shall be submitted

for all computing modules and function generating modules and shall include the actual scaling factors and units used.

4. Panel Construction Drawings

a. Shop Drawings and Catalog Cuts

- i. Provide detailed shop drawings and catalog cuts for panels, instrument racks, and enclosures. Drawings shall show the location of front panel and internal sub-panel mounted devices to scale and shall include a panel legend and bill of materials. Layout drawings shall show major dimensions as well as elevations, in inches from the base up, of the rows of components.
- ii. Panel Layouts shall be modeled in 3D, and model electronic files are to be supplied in a format that can be directly opened or imported into SolidWorks Version 2019. Panel layout drawings shall show both 3D and 2D view formats.
- iii. Shop drawings shall indicate location and size of available spare mounting space for rear-of-panel devices.
- iv. The panel legend shall list and identify front of panel devices by their assigned tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.
- v. The bill of materials shall include devices mounted within the panel that are not listed in the panel legend, and shall include the device tag number, quantity, description, manufacturer, and complete model number.
- vi. Where possible CSI shall utilize vendor/manufacturer 3D model components in their 3D assembly models/drawings. If CSI has to generate component model, it must be accurate in size and shape of the real component. No unrecognizable, or unscaled shapes will be accepted as a 3D component model.

b. Color Schedule

- i. Provide a color schedule with color samples for control panels for the Owner's selection/approval.

5. Power Requirement and Heat Dissipation

- a. Provide a summary of the power requirements and heat dissipation for control panels. Power requirements shall state required voltages, currents, and phase(s) Heat dissipations shall be maximums and shall be given in BTU/Hr. Summary shall be supplemented with calculations.

6. Panel Wiring Diagrams

- a. Wiring diagrams shall be similar to those diagrams shown in the Contract Drawings, but with the addition of all auxiliary devices such as additional relays, alarms, fuses, lights, hand switches and interlocks.
- b. Provide complete terminal identification of external primary elements, panels, and junction boxes that interface directly to the panel wiring being shown. Polarity of analog signals shall be shown at each terminal.

- c. External wiring that the electrical contractor must provide and wire shall be shown as a dotted line. Special cables that are provided with the instrument shall be clearly identified.
 - d. Panel wiring diagrams shall identify wire numbers and types, terminal numbers, and tag numbers. Wiring diagrams shall show each circuit individually. Common or typical diagrams shall not be allowed.
 - e. Provide panel power wiring diagrams for panels. The diagrams shall include grounding requirements.
7. Interconnecting Wiring Diagrams
- a. Diagrams shall show component and terminal board identification numbers, external wire and cable numbers. The drawings shall show intermediate terminations between field elements and panels (e.g., terminal junction boxes). This diagram shall be coordinated with the Contractor and shall bear his mark showing that this has been done.
8. Loop Diagrams
- a. Provide an individual wiring diagram for each analog loop showing terminal numbers, the location of the DC power supply, the location of any dropping resistors, the location and connection of the surge protection devices. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus the following requirements:
 - b. Each loop diagram shall be divided into three areas for identification of device locations: panel face, back-of-panel, and field respectively. Each loop diagram shall list (1) Transmitter Drive Capability, (2) Loop Impedance, (3) Transmitter Reserve Drive Capability. Loop diagrams shall be on 11-inch by 17-inch Drawings.
9. Instrument Installation Details
- a. The CSI shall review the Contract Documents and develop and submit for review, complete installation details for each field mounted device and panel prior to shipment and installation. Common details, not requiring any modification, may be referenced by an index showing the complete instrument tag number, service, location, and device description. Installation details shall be provided as required to adequately define the installation of the ICM system components.
10. Operator Interface Submittal
- a. This submittal shall cover the specific plant control schemes as well as the details of the plant reports and process graphic displays.
 - b. The submittal shall contain the semi-final details of all logs, reports, and process graphic displays. The specifics of what shall appear on each display and what calculations are required to support them shall be developed and submitted.
 - c. Submitted process graphic displays shall be no smaller than 8.5-inches by 11-inches and in full color.

- d. A complete listing of all signals to be collected for long term historical information shall be provided. This listing shall also include frequency of data sampling and duration for which the data shall be immediately accessible.
- e. A complete listing of all signals to be collected for trend display shall be provided. This listing shall also include frequency of data sampling and duration for which the data shall be immediately accessible.

11. Process Control Strategy Submittal:

- a. The process control schemes shall be developed in a ladder logic diagram or functional block (logic) diagram presentation based on information from the Contract Documents. Included with each diagram shall be:
 - i. Brief Scope of the Control Function.
 - ii. Listing of all scanned inputs to the control function.
 - iii. A short narrative of the control strategy.
 - iv. Any assumptions made in developing the program.
 - v. Listing of all inputs and outputs (i.e., AI, DI, AO, DO) from the control function.
 - vi. Cross reference list of all I/O showing to which I/O modules or software modules they are linked.
 - vii. Listing of all operator inputs/outputs to and from the control function. Any special displays related to the function shall be illustrated. A description of the operation of any panels shall be described as it relates to the control function.
 - viii. Failure contingencies shall be described in detail.
 - ix. A flowchart representing the control strategy.
- b. This submittal shall cover all the associated logic developed under the CSI required to implement the control functions specified.
- c. The System Integrator shall submit annotated logic on 8-1/2-inch x 11-inch format and as an ASCII file on USB Drives for all logic developed. Annotation shall be 3 lines of 6 characters each for every logic contact. In addition, each network or rung shall be annotated so that a non-technical person can read and easily comprehend what control function the rung or network is performing.
- d. This submittal shall also include copies of the PLC I/O configuration tables, I/O reference usage table, complete cross reference to specific rung used of all inputs, outputs, internal coils, data registers, and special purpose coils. In addition, any special switch settings or hardware configuration requirements such as com port configurations shall be described in detail and submitted.
- e. Provide reference to fully documented ladder logic file in the current respective PLC programming software file format.

D. Test Related Submittals

Provide five (5) copies of the following:

1. Operational Field Acceptance Test (OAT) Documentation.

The CSI shall submit an example of each type of Instrument Calibration Sheet and Loop Status Report that will be used for the OAT.

After approval of the examples, the CSI shall prepare Loop Status Report Sheet(s) for each loop and an Instrument Calibration Sheet for each active ICM system element (except simple hand switches, lights, etc.) These sheets shall be submitted after the tests are completed.

a. Instrument Calibration Sheets.

i. Provide a written report to the Engineer on each instrument certifying that it has been calibrated to its published specified accuracy. This report shall include all applicable data as listed below plus any defects noted, correction action required, and correction made. Data shall be recorded on prepared forms and shall include not less than the following items:

- a) Facility identification (Name, location, etc.)
- b) Loop identification (Name or function)
- c) Equipment tag and serial numbers.
- d) Scale Ranges and units.
- e) Test mode or type of test.
- f) Input values or settings.
- g) Expected outputs and tolerances
- h) Actual readings at 10%, 50%, and 90% of span.
- i) Explanations or special notes as applicable.
- j) Date, time, and weather.
- k) Tester's certification with name and signature.

2. Functional Acceptance Test Documentation.

The CSI shall prepare two types of test procedures and forms as follows.

a. Loop Test Documentation

For functions that can be demonstrated on a loop-by-loop basis, the form shall include:

- i. Project Name.
- ii. Loop number.
- iii. Loop description.
- iv. Test procedure description, with a space after each specific test to facilitate sign off on completion of each test.
- v. For each component: tag number, description, manufacturer, and data sheet number.
- vi. Space for sign off and date by the CSI, the Contractor, and the Engineer.

b. Functional Test Documentation

For those functions that cannot be demonstrated on a loop-by-loop basis, the test form shall be a listing of the specific tests to be conducted. With each test description the following information shall be included:

- i. Specification page and paragraph of function demonstrated.
- ii. Description of Function.
- iii. Test procedure description.
- iv. Space after each specific test to facilitate signoff on completion of each test.

E. Testing

1. Factory Testing, field Testing, and Final Acceptance Testing shall be in accordance with the requirements of Section 40 90 01 – Instrumentation, Control and Monitoring System Testing Requirements.
2. System Commissioning Assistance.
 - a. Provide the services of a factory trained and field experienced instrumentation engineer to assist Owner's personnel during each startup of the various systems. Purpose of this assistance is to support in making final adjustments of settings on the instrument systems.

F. Operation & Maintenance Manuals.

Furnish Instruction Manuals and Parts Lists for instrumentation equipment in accordance with the requirements of Division 1 and as noted herein.

1. Schedule.
 - a. Deliver manuals not later than the equipment shipment date. After installation is complete, update the manuals to reflect any changes which occurred during installation and deliver balance of manuals to Engineer.
2. Material Content. Include in the manuals not less than the following applicable information for each instrument, equipment, subsystem and/or control loop. The O&M Manuals shall consist of, at least, the following material:
 - a. Bill of Materials.
 - i. A listing of all the panels, racks, instruments, components, and devices supplied. Components shall be grouped by component type, with the component types identified in a similar manner to the component identification code used in these specifications. The list shall contain, as a minimum:
 - a) Instrument, panel, rack or device tag number.
 - b) Description.
 - c) Quantity supplied.
 - d) Reference to component data sheet and/or catalog cut.
 - e) Component type.
 - b. Component Data Sheets.
 - i. See Paragraph 1.03 C.2 specified herein before.
 - c. Catalog Cuts.
 - i. See Paragraph 1.03 C.a specified herein before.

- d. Component O&M Manuals.
 - i. An O&M manual shall be submitted for instruments and devices supplied. The O&M manuals shall contain, as a minimum:
 - a) Operating procedures.
 - b) Installation procedures.
 - c) Maintenance procedures.
 - d) Troubleshooting procedures.
 - e) Calibration procedures.
 - f) Internal device schematics and wiring diagrams.
 - g) Shut-down procedures.
 - h) Component parts list.
 - i) Detailed circuit operational description including annotated programmable controller ladder diagrams.
- e. Spare Parts and Expendables List
 - i. The spare parts and expendables list shall include not only those items supplied, but also the additional items recommended for successful long term operation.
- f. "As-Shipped" Drawings
 - i. Drawings shall be a record of work "As-Shipped" from the factory and shall be labeled as "As-Shipped." One copy of applicable schematics and diagrams shall be placed in each control panel in a protective envelope or binder. Provide the following "As-Shipped" drawings as a minimum:
 - a) Panel Fabrication Drawings.
 - b) Panel Wiring and Interconnection Drawings. Note: All interconnection wiring shall have the same label on both ends of the wire.
- g. Integrator shall supply O&M Manuals and at a minimum Red Lined as installed record drawings, prior each part of the system that goes online. One hard copy of these drawings are to be installed in each related panel, and one in a binder in the instrumentation office.
- h. Electronic copies of as installed Electrical Schematics (Redline PDF's are acceptable at initial startup), PLC, HMI, SCADA, and Instrumentation Configuration files are to be supplied on a USB storage drive, prior to each part of the system going online.
- i. Printed copies of PLC programs will not be required, but annotation of files must be completed as outlined in the specification.
- j. For all electronic devices and instrumentation that are capable of being configured electronically, integrator shall supply backup configuration files on USB drive. Additionally, in the instrumentation calibration or device setup sheets any modifications to parameters from factory default shall be documented.

G. Final Record Documentation

- 1. Reproducible Drawings. Contractor shall submit reproducibles of finished schematics, wiring diagrams and installation drawings to include installed field and

panel instruments, mounting details, point to point diagrams with a cable, wire, and termination numbers. Drawings shall be a record of work as actually constructed and shall be labeled as "RECORD DOCUMENTS", in accordance with the requirements of Section 01 70 00 – Execution and Closeout Requirements. One copy of applicable schematics and diagrams shall be placed in each control panel in a protective envelope or binder.

- a. Loop Diagrams.
 - i) See Paragraph 1.03 C.8 specified herein before.
 - b. Panel Fabrication and Wiring diagrams.
 - i) See Paragraph 1.03 C.4 and 1.03 C.6 specified herein before.
 - c. Interconnecting Wiring Diagrams.
 - i) See Paragraph 1.03 C.7 specified herein before.
 - d. Instrument Installation Details.
 - i) See Paragraph 1.03 C.9 herein before.
2. Process and Instrumentation Diagrams (P&ID's).
- a. The Engineer will supply the Contractor with general P&ID for revisions to reflect the final installed system.
 - b. The P&ID's shall be updated by the Contractor who may use these drawings for producing the final documentation.
3. Software Documentation. In addition to the reproducible hard copy of drawings and literature generated specifically for the project, Contractor shall submit CDs to the Engineer with a copy of all custom files specifically created to generate the drawings, data sheets, bill of materials, operating procedures etc. Drawing format shall be compatible with AutoCAD ver. 2016 or newer. USB Drives shall be clearly identified by the following:
- a. Project Name.
 - b. Volume Number.
 - c. Software Program Name and Version used to generate the files.
 - d. Labeled "RECORD DOCUMENTS."

H. Training Requirements.

1. General:
 - a. Contractor shall provide the services of a CSI factory trained and field experienced instrumentation engineer to conduct group training of Owner's designated personnel in the operation of each instrument system. Obtain Owner's written consent that the training has been adequate. Include instruction covering basic system theory, operating principles and adjustments, routine maintenance and repair, and "hands on" operation. The text for this training shall be the P&ID's, graphic operation interface, PLC and SCADA software, panel wiring diagrams and layouts, and the operation and maintenance manuals furnished under these Specifications.
2. Duration:

- a. Training specific to the system control panel hardware and software. This training shall be for a minimum time period of five (5) 8-hour days and 6 trips. This training shall be separate from start-up and testing.
- 3. Operator Training:
 - a. Operator training shall include instruction in the use of Control Panels and Field Panels furnished.
Maintenance Training:
 - b. Maintenance training shall include instruction in the calibration, maintenance, and repair required for all instruments.
- I. Post-Contract System Support.
 - 1. Maintenance Contract:
 - a. Duration.
 - i. Provide a 1 year maintenance contract for components furnished starting from the date of acceptance.
 - b. Schedule.
 - i. Develop a program of preventive maintenance visits that includes verification of instrument performance on a monthly basis and complete calibration of instruments on a semi-annual basis. After every visit, submit to the Owner records of instrument verification and calibration on appropriate forms.
- J. Guarantee and Warranties
 - 1. The equipment manufacturers shall warrant and guarantee against defective equipment, workmanship, and materials under normal use, operation and services, unless otherwise noted in other Division 40 Sections shall be for a period of 2 years after acceptance from the final date or final resolution of the Owner acceptance of Work as substantially complete. For equipment bearing a manufacturer's warranty in excess of two years, furnish a copy of the warranty to Engineer with Owner named as beneficiary.
- K. Acceptable Manufacturers
 - 1. The following manufacturers and model numbers have been preselected by Owner and shall be used for the project:

#	EQUIPMENT TYPE	PRESELECTED VENDOR
1	UPS	EATON 5P-1500 WITH INDUSTRIAL GATEWAY CARD
2	FREE CHLORINE ANALYZER	AQUA2000-FCL
3	FLUORIDE TRANSMITTER/SENSOR	ASTI IOTRON 3TX-ISE
4	FLOW SWITCH	IFM #KQ5101 CAPACITIVE SENSOR
5	PLC	ALLEN-BRADLEY 5000 SERIES FLEX I/O
6	ETHERNET SWITCH	HIRSCHMANN BOBCAT, PART #942170009 WITH MULTIMODE LC SFP MODULES
7	LIMIT SWITCHES	HONEYWELL HDLS LS2 SERIES 316 SS BODY AND ARM LS2C4K
8	LEVEL TRANSMITTER/SENSOR	SIEMENS SITRANS LUT420HMI
9	SURGE SUPPRESSOR	PHOENIX CONTACT PART NUMBERS 2856812, 2920078 & 2920023 WITH FAULT INDICATING CONTACT
10	FLOOD SENSOR	FLOWLINE MODEL SWITCH-TEK LO10
11	SAMPLE PUMP	GRUNDFOS MODEL 5SQ05-90 WITH CU300 CONTROLLER AND SPP1 POTENTIOMETER
NOTES: 1. ALTERNATIVES TO THE PRESELECTED EQUIPMENT SHALL BE SUBMITTED DURING BID PROCESS FOR ENGINEER'S PREAPPROVAL		
2. INTERNAL LCP POWER SUPPLIES, RELAYS, TERMINAL BLOCKS ETC. SHALL BE PHOENIX CONTACT.		

PART 2 - PRODUCTS

2.01 HARDWARE REQUIREMENTS

A. Job Conditions.

- Contract Drawings are diagrammatic and show the intended arrangement for system operation, piping, and appurtenances. Conform to Contract Drawings as closely as possible and exercise care (1) to secure neat arrangement of piping, valves, conduit, and like items, and (2) to accommodate structural features. Verify dimensions and conditions at the project site and install materials and equipment in the available spaces.

B. Materials and Standard Specifications.

- Provide instruments, equipment and materials suitable for service conditions and meeting standard specifications such as Instrument Society of America (ISA). The intent of this Specification is to secure instruments and equipment of a uniform quality and manufacture throughout the facilities, instruments supplied by the Contractor, of the same type shall be by the same manufacturer. All panel mounted instruments shall have matching style and general appearance. All meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the shop drawings unless otherwise required to match existing equipment. This allows the stocking of the minimum number of spare parts.
- All new control panels shall have UL 508A certification and shall meet NFPA 79: The Electrical Standard for Industrial Machinery requirements.
- Manufacturers and model numbers for Instruments, switches and devices are preselected by Owner. See Drawing E-802 for a list of preselected equipment.
- all electronic hardware and software shall be the latest versions available at the time of installation.

C. Product Delivery, Storage, and Handling.

1. Box, crate, or otherwise enclose and protect instruments and equipment during shipment, handling, and storage. Keep all equipment dry and covered from exposure to weather, moisture, corrosive liquids and gases or any element which could degrade the equipment. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Repair any damage as directed and approved.

D. Mountings.

1. Mount and install equipment as indicated. Where not shown, mount field instruments according to best standard practice on pipe mounts, pedestal mounts, or other similar means in accordance with suppliers' recommendations. Unless specified otherwise all mounting hardware shall be stainless steel. Where mounted in control panels, mount according to manufacturer recommendations.
2. Equipment specified for field mounting shall be suitable for direct pipe mounting, pedestal mounting, or surface mounting. Non in-line indicators and equipment with calibration adjustments or requiring periodic inspection shall be mounted not lower than three (3) feet nor higher than five (5) feet above walkways, platforms, and catwalks. Such equipment shall be weather and splash proof, and corrosion resistant and electrical equipment shall be in Type 316 stainless steel NEMA 4X cases unless otherwise noted.
3. All electronic equipment (Power Supplies, PLC Racks, etc.) shall be mounted vertically or outlined by the manufacturer for optimal convection cooling.

E. Instrument Identification.

1. Components provided under this Section, both field and panel mounted, shall be provided with permanently mounted name tags bearing the entire ISA tag number of the component. Panel mounted tags shall be plastic; field mounted tags shall be stamped stainless steel. Tag shall include "Power from" and "Signal to" information.
2. Nameplates shall be provided for panels and panel mounted equipment.
3. Field mounted tags shall be 16-gauge, Type 304 stainless steel with 3/16-inch high characters. The identification tag lettering shall be stamped, or engraved such that the lettering will not fade overtime. These requirements also apply to related conduit tagging.
4. Tags shall be attached to equipment with a commercial tag holder using a stainless steel band with a worm screw clamping device or by a holder fabricated with standard stainless steel hose clamps and meeting the same description. In some cases where this would be impractical, use 20 gage stainless steel wire.
5. For field panels or large equipment cases use stainless steel screws, however, such permanent attachment shall not be on an ordinarily replaceable part. In each case, the tag shall be plainly visible to a standing observer and not obscure adjustment ports or impair the function of the instrument. Field mounted control stations, recorders or indicators shall have a nameplate indicating their function and the variable controlled or displayed. Nameplate shall be attached by one of the above methods.

F. Electronic Equipment.

1. If the equipment is electronic in nature, provide solid state equipment to the greatest extent practicable. Select components of construction for their suitability and reliability. Employ adequate component derating to preclude failures because of transients and momentary overloads reasonably expected in normal operation. Where conduit connection is provided for mounting a surge/lightning suppresser directly to the instrument, the arrestor shall be so mounted. Field equipment shall have a Phoenix Contact (or approved equal) surge suppresser mounted on the instrument housing, if such mounting is provided on the instrument, otherwise a threaded surge suppresser connection shall be provided on the conduit as close as practical to the instrument. Surge suppressors shall include fault indicators and contact for connection to plant SCADA system. All components shall be finger safe type.

G. Equipment Operating Conditions.

1. Equipment shall be rated for normal operating performance with varying operating conditions over the following minimum ranges:
2. Power:
 - a. Electrical. 115 VAC +/- 10%, 60 Hz +/-1 Hz except where specifically stated otherwise on the drawings or in the specifications.
3. Field Instruments:
 - a. Atmospheric contaminants (All Areas):
 - i. Hydrogen Sulfide: 0.1 mg/l.
 - ii. Chlorine: 0.01 mg/l.
 - iii. Ammonia: 0.5 mg/l.
 - iv. Dust: 50.0 µg/m³.
 - b. Outdoor Areas:
 - i. Ambient Temperature: -20°F to +120°F.
 - ii. Ambient Relative Humidity: 10% to 100%.
 - iii. Weather: Rain, wind, sun and blowing sand.
4. Indoor Environmentally Uncontrolled Areas:
 - a. Ambient Temperature: 40°F to +105°F.
 - b. Ambient Relative Humidity: 20% to 80%.
5. Indoor Environmentally Controlled Areas:
 - a. Ambient Temperature: 55°F to +85°F.
 - b. Ambient Relative Humidity: 20% to 80%.
 - c. Short term excursions to temperature limits for non-environmental controlled areas.

6. Provide, as necessary, enclosures, heat tracing, heaters and sunshields, etc. to assure normal operations under these conditions.
7. Corrosive Areas: Provide instrument enclosures and hardware suitable for the corrosive location.

H. Power Supplies.

1. Provide electrical instruments and control devices for operation on 24VDC where practical, and 120VAC as required if existing source, or other approved situation. Protect each device power supply with properly sized fuses.
2. Uninterruptable Power Supply (UPS) shall be supplied in control panels as shown on the Contract Drawings for providing uninterruptable power to electronic equipment.
3. Output overvoltage and overcurrent protective devices shall be provided for DC power supplies to protect instruments from damage due to power supply failure and to power supply from damage due to external failure. Power supplies shall be mounted such that dissipated heat does not adversely affect other components. Source of operating power shall be 120 VAC, 60 Hz commercial power. Units shall be mounted within the control panels. Power supply fusing shall be provided with blown fuse indicators.

I. Signal Isolators, Converters and Conditioners.

1. Insure that input-output signals of all instruments and control devices (new and existing) are compatible. Analog signals between field and panels shall be 4-20 mA unless specifically approved otherwise. Granting such approval does not relieve the Contractor from the compatibility requirement above. Provide signal isolators and converters as necessary to obtain the required system performance. Mount the devices behind control panels or in the field at point of application, as required for accurate signal acquisition.

J. Auxiliary Contacts by Others.

1. Provide instruments and equipment to connect to auxiliary contacts provided by others for alarms, status of equipment, interlocking, and other functions as indicated and as specified herein.

K. Painting.

1. Provide factory paint for instruments and equipment except where in pipelines.

L. Electrical.

1. Work shall include the power supply wiring, instrumentation wiring, interconnecting wiring and equipment grounding as indicated, specified and required and not specifically included under Division 26.
2. Wiring installations shall include cables, conductors, terminals, connectors, wire markers, conduits, conduit fittings, supports, hardware and all other required materials not specifically included in the Work of other Divisions.

3. Provide the materials and complete the required installations for equipment grounding as specified in Division 26 of these Specifications and indicated on the Contract Drawings.
4. Incidental items not specifically included in the Contract Documents that can legitimately and reasonably be inferred to belong in the instrumentation work shall be provided and installed by the Contractor at no additional cost to the Owner.
5. Field Wiring. For wiring materials, refer to Division 26 and Details on the Contract Drawings. Test signal wiring for continuity prior to termination. Provide wire number tags marked in indelible waterproof form of slip-on type heat shrink label or equal for each termination.

M. Process Connections.

1. Provide instrument piping, tubing, and capillary tubing to meet the intended process service and ambient environmental condition for corrosion resistance, etc. All instrument pneumatic tubing shall be Type 316 stainless steel. Slope lines according to service to promote self draining or venting back to the process. Terminate connection to process lines or vessels in a service rated block valve that will permit closing off the sense line or removal of the element without requiring shut down of the process. Include drip legs and blow-down valves for terminations of sense lines at the instruments when mounted such that condensation can accumulate. Process vessels, line penetrations, connecting fittings, and block valves shall be furnished and installed under other Divisions of these Specifications but coordinated by Division 40.

N. Electrical Transient Protection.

1. Instrument and control equipment mounted outside of protective structures (field mounted equipment) shall be equipped with surge-arresting devices to protect the equipment from damage due to electrical transients induced in the interconnecting lines from lightning discharges or nearby electrical devices. Both power and signal circuits shall be protected with surge and transient protectors installed at the source and destination ends of the circuits. Protective devices used on 120 VAC inputs to field mounted equipment shall be secondary surge protectors conforming to the requirements of IEEE C62.41 8/20 μ s wave form.
2. Surge and transient protectors shall be normally connected to the electrical system ground. When an electrical system ground is not available near the device, the protectors shall be connected to a ground rod located within 10 feet of the device. The ground rod shall meet all the requirements of Section 26 05 26 - Grounding and Bonding, in Division 26, Electrical.
3. Protectors for analog signal circuits on or near field instrument housings shall be Phoenix Contact Surge Trab Series, or approved equal.
4. Protectors shall be provided for conductors penetrating panel enclosures for power circuits protectors shall be Phoenix Contact PT Series, or approved equal. For analog and data circuits protectors shall be din rail mounted Phoenix Contact TTC series, or approved equal. Surge suppressors shall include fault indicators and contact for connection to plant SCADA system.

O. Spares and Maintenance Materials.

1. Furnish the following items as specified herein. Deliver to Owner, as directed, with itemized list in a letter of transmittal accompanying each shipment.
2. Materials shall be delivered in the manufacturer's original containers labeled to completely describe contents and equipment for which it is furnished.
3. One circuit breaker for each size and type for every ten used but not less than two of each type.
4. One Fuse of each size and type for every five used but no less than five of each type.
5. One Relay of each type for every five used but no less than two of each type.
6. One Surge Protector for every five used but no less than four of each type.
7. One PLC I/O module for each type.

PART 3 - EXECUTION

3.01 PRODUCT HANDLING

- A. Shipping Precautions: After completion of shop assembly, factory test, and approval, all equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weight shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.
- B. Special Instructions: Special instructions for proper field handling, storage, and installation required by the Manufacturer shall be securely attached to each piece of equipment before packaging and shipment.
- C. Tagging: Each component shall be tagged to identify its location, instrument tag number, and function in the system. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment in the ICM system. Identification shall be prominently displayed on the outside of the package.
- D. Storage: Equipment shall not be stored outdoors. Equipment shall be stored in dry permanent shelters, including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired by the Contractor at no additional cost to the Owner. If any apparatus has been subject to possible damage by water, it shall be thoroughly dried out and put through tests as directed by the Engineer. Such tests shall be at no additional cost to the Owner, and if the equipment fails the tests, it shall be replaced at no additional cost to the Owner.
- E. Protection during Construction: Instrumentation and Controls shall at all times during construction be adequately protected against mechanical injury, water damage, corrosion,

dirt, dust and foreign material. Equipment equipped with internal electrical heaters shall have them energized to keep the equipment dry. Doors to control panels and cabinets shall be kept closed at all times when work on them is not being done. Control Panels, Analyzers, sensitive electronic or computer equipment and/or controls or other materials not sealed and/or suitable for continuous outdoors storage shall not be stored out-of-doors. Such Instrumentation and Controls shall be stored in dry permanent shelters.

- F. Paint Finish: Any damage to factory applied paint finish shall be repaired using touch-up paint furnished by the instrument or equipment manufacturer, in conformance with the equipment vendor requirements.

3.02 MANUFACTURER'S SERVICES

- A. Furnish the following Manufacturer's services for all instrumentation provided:
 1. Perform bench calibration.
 2. Oversee installation.
 3. Verify installation of installed instrument.
 4. Certify installation and reconfirm Manufacturer's accuracy statement.
 5. Oversee loop testing, prepare loop validation sheets, and certify loop testing.
 6. Oversee pre-commissioning, prepare pre-commissioning validation sheets, and certify pre-commissioning.
 7. Train the Owner's personnel.

3.03 INSTALLATION

- A. General:
 1. All instrumentation, including instrumentation furnished under other Divisions, shall be installed per the manufacturers' instructions and Division 40.
 2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment that do not impact material quantities or cause material rework, make such changes without additional cost to the Owner.
- B. Conduit, Cables, and Field Wiring
 1. All conduit shall be provided, in accordance with Section 26 05 33 – Conduit.
 2. All 4-20 mA signal circuits, process equipment control wiring, signal wiring to field instruments, remote I/O, PLC I/O, and other non-specialty field wiring and cables shall

be provided and installed, in accordance with Section 26 05 05 – Wire and Cable (600V). Provide additional lengths(2 ft) looped inside the cabinets.

3. All ICM system specialty cables, data highway fiber optic cable and specialty cable termination devices shall be provided under Division 40 and installed, in accordance with Section 26 05 05 – Wire and Cable (600V).
 4. All field cables and wiring terminations and wire identification at ICM system equipment furnished under this or any other Division shall be provided in accordance with the requirements of Section 26 05 05 – Wire and Cable (600V). All terminations shall be checked by the equipment supplier and the electrical contractor.
- C. Instrumentation Tie-Downs: All instruments, control panels, and equipment shall be anchored by methods that comply with seismic requirements that apply to the site.
- D. Existing Instrumentation: Each existing instrument to be removed and reinstalled shall be cleaned, reconditioned and recalibrated by an authorized service facility of the instrument Manufacturer. Provide certification of this Work before reinstallation of each instrument. Provide replacement for interim period as required.
- E. Ancillary Devices: The Contract Documents show all necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements at no additional cost to the Owner. All such additions and all such changes, including the proposed method of installation, shall be submitted to the Engineer for approval before commencing the Work. Such changes shall not be a basis of claims for extra work or delay.
- F. Installation Criteria and Validation: All field-mounted components and assemblies shall be installed and connected according to the requirements below:
1. Installation personnel have been instructed on installation requirements of the Contract Documents.
 2. Technical assistance is available to installation personnel at least by telephone.
 3. Installation personnel have at least one copy of the approved shop drawings and data.
 4. Instrument process sensing lines shall be installed similar to conduit specified under Section 26 00 00 - Basic Electrical Provisions. Individual tubes shall run parallel and near the surfaces from which they are supported. Supports shall be used at intervals of not more than 3-feet of rigid tubing.
 5. Bends shall be formed to uniform radii with the proper tool without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square-cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at all panels requiring pipe or tubing entries.
 6. All differential pressure elements shall have three valve manifolds.
 7. All flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.

8. All power and signal wires shall be terminated with crimped type lugs.
9. All connectors shall be, as a minimum, water tight.
10. All wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature and shall clearly identify From and To destinations.
11. All wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal to terminal without splices unless specifically approved by the Engineer. All wiring shall be protected from sharp edges and corners.
12. All mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
13. Verify the correctness of each installation, including polarity of electric power and signal connections, and making sure all process connections are free of leaks. Certify in writing that for each loop or system checked out, all discrepancies have been corrected.
14. The Owner will not be responsible for any additional cost of rework attributable to actions of the Contractor or the CSI.

3.04 CALIBRATION

- A. General: All devices provided under the instrumentation Sections shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.
- B. Calibration Points: Each instrument shall be calibrated at 20, 40, 60, 80 and 100% of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Testing Standards.
- C. Bench Calibration: Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.
- D. Field Calibration: Instruments that were not bench-calibrated shall be calibrated in the field to insure proper operation in accordance with the instrument loop diagrams or specification data sheets.
- E. Analyzer Calibration: Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. All samples and sample gases shall be furnished by the manufacturers.
- F. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. Have the Instrumentation

Supplier sign the tag when calibration is complete. The Engineer will sign the tag when the calibration and testing has been accepted.

3.05 LOOP TESTING

- A. General: Individual instrument loop diagrams per ISA Standard S5.4 - Instrument Loop Diagrams, expanded format, shall be submitted to the Engineer for review before the loop tests. The Contractor shall notify the Engineer of scheduled tests a minimum of 30 days before the estimated completion date of installation and wiring of the ICM. After the Engineer's review of the submitted loop diagrams for correctness and compliance with the specifications, loop testing shall proceed. The loop check shall be witnessed by the Engineer.
- B. Control Valve Tests: All control valves, cylinders, drives and connecting linkages shall be stroked from the operator interface units as well as local control devices and adjusted to verify proper control action, hand switch action, limit switch settings, torque settings, remote control actions, and remote feedback of valve status and position. Control valve actions and positioner settings shall be checked with the valves in place to ensure that no changes have occurred since the bench calibration.
- C. Interlocks: All hardware and software interlocks between the instrumentation and the motor control circuits, control circuits of variable-speed controllers and packaged equipment controls shall be checked to the maximum extent possible.
- D. Instrument and Instrument Component Validation: Each instrument shall be field tested, inspected, and adjusted to its indicated performance requirement in accordance its Manufacturer's specifications and instructions. Any instrument that fails to meet any Contract requirement, or, in the absence of a Contract requirement, any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the direction of the Engineer at no additional cost to the Owner.
- E. Loop Validation: Controllers and electronic function modules shall be field tested and exercised to demonstrate correct operation. All control loops shall be checked under simulated operating conditions by impressing input signals at the primary control elements and observing appropriate responses of the respective control and monitoring elements, final control elements, and the graphic displays associated with the SCADA and PLC. Actual signals shall be used wherever available. Following any necessary corrections, the loops shall be retested. Specified accuracy tolerances for each analog network are defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be as indicated by Contract requirements or by published manufacturer accuracy specifications, whenever Contract accuracy requirements are not indicated. Each analog network shall be tested by applying simulated analog or discrete inputs to the first element of an analog network. For networks that incorporate analog elements, simulated sensor inputs corresponding to 20, 40, 60, 80 and 100% of span shall be applied, and the resulting element outputs monitored to verify compliance to calculated root-mean-square-summation accuracy tolerance requirements. Continuously variable analog inputs shall be applied to verify the proper operation and setting of discrete devices. Provisional settings shall be made on controllers and alarms during analog loop tests. All analog loop test data shall be recorded on test that include

calculated root-mean-square-summation system accuracy tolerance requirements for each output.

- F. Loop Validation Sheets: Prepare loop confirmation sheets for each loop covering each active instrumentation and control device except simple hand switches and lights. Loop confirmation sheets shall form the basis for operational tests and documentation. Each loop confirmation sheet shall cite the following information and shall provide spaces for sign-off on individual items and on the complete loop provided by the CSI:
1. Project name.
 2. Loop number.
 3. Tag number, description, manufacturer and model number for each element.
 4. Installation bulletin number.
 5. Specification sheet number.
 6. Loop description number
 7. Adjustment check.
 8. Space for comments.
 9. Space for loop sign-off by Instrumentation Supplier and date.
 10. Space for Engineer witness signature and date.
- G. Loop Certifications: When installation tests have been successfully completed for all individual instruments and all separate analog control networks, a certified copy of all test forms signed by the Engineer as a witness, with test data entered, shall be submitted to the Engineer together with a clear and unequivocal statement that all instrumentation has been successfully calibrated, inspected, and tested.

3.06 PRE-COMMISSIONING

- A. General: Pre-commissioning shall start after acceptance of all wire test, calibration tests and loop tests, and all inspections have demonstrated that the instrumentation and control system complies with all Contract requirements. Pre-commissioning shall demonstrate proper operation of all systems with process equipment operating over full operating ranges under conditions as closely resembling actual operating conditions as possible.
- B. Pre-commissioning Procedures and Documentation: All pre-commissioning and test activities shall follow detailed test procedures and check lists accepted by the Engineer as submitted for approval by the CSI. All test data shall be acquired using equipment as required and shall be recorded on test forms accepted by the Engineer, that include calculated tolerance limits for each step. Completion of all system pre-commissioning and test activities shall be documented by a certified report, including all test forms with test data entered, delivered to the Engineer with a clear and unequivocal statement that all system pre-commissioning and test requirements have been satisfied.
- C. Operational Validation: Where feasible, system pre-commissioning activities shall include the use of water to establish service conditions that simulate, to the greatest extent

possible, normal final control element operating conditions in terms of applied process loads, operating ranges, and environmental conditions. Final control elements, control panels, and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using motor control center and local field mounted control circuits. All hardwired and software control circuit interlocks and alarms shall be operational. The control of final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits. The stable steady-state operation of final control elements running under the control of field mounted automatic analog controllers or software based controllers shall be assured by adjusting the controllers as required to eliminate oscillatory final control element operation. The transient stability of final control elements operating under the control of field mounted, and software based automatic analog controllers shall be verified by applying control signal disturbances, monitoring the amplitude and decay rate of control parameter oscillations (if any) and making necessary controller adjustments as required to eliminate excessive oscillatory amplitudes and decay rates.

- D. Loop Tuning: All electronic control stations incorporating proportional, integral or differential control circuits shall be optimally tuned, experimentally, by applying control signal disturbances and adjusting the gain, reset, or rate settings as required to achieve a proper response. Measured final control element variable position/speed set point settings shall be compared to measured final control element position/speed values at 20, 40, 60, 80 and 100% of span and the results checked against indicated accuracy tolerances.
- E. Pre-commissioning Validation Sheets: Pre-commissioning shall be documented on one of two types of test forms as follows:
 - 1. For functions that can be demonstrated on a loop-by-loop basis, the form shall include:
 - a. Project name.
 - b. Loop number.
 - c. Loop description.
 - d. Tag number, description, manufacturer and data sheet number for each component.
 - e. Space for sign-off and date by both the CSI and the Engineer.
 - 2. For functions that cannot be demonstrated on a loop-by-loop basis, the test form shall be a listing of the specific tests to be conducted. With each test description the following information shall be included:
 - a. Specification page and paragraph of function demonstrated.
 - b. Description of function.
 - c. Space for sign-off and date by both the CSI and the Engineer.
- F. Pre-commissioning Certification: Submit an ICM system pre-commissioning completion report that shall state that all Contract requirements have been met and shall include a listing of all instrumentation and control system maintenance and repair activities conducted during the pre-commissioning testing. Acceptance of the instrumentation and control system pre-commissioning testing must be provided in writing by the Engineer

before the performance testing may begin. Final acceptance of the control system shall be based upon plant completion as stated in the General Conditions.

3.07 ONSITE SUPERVISION

- A. Furnish the services of an on-site service engineer to supervise and coordinate installation, adjustment, testing, and start-up of the ICM system. The Engineer will be present during the total period required to affect a complete operating system. A qualified team of the Instrumentation Subcontractor personnel shall be on site as required to check all equipment, perform the tests indicated in this Section, and furnish startup services.

3.08 PERFORMANCE TEST

- A. The entire ICM system shall operate for 30 days without failure.
- B. Furnish all necessary support staff as required to maintain the system and to satisfy the repair or replacement requirements.
- C. If any component fails during the performance test, it shall be repaired or replaced within 4 hours and the ICM system shall be restarted. If the system is not repaired and running within four (4) hours or more than six component failures within the four (4) hour repair period, the system shall be restarted and operate for an additional 30 days without failure.

3.09 TRAINING

- A. Test entire ECM system in accordance with the requirements of Section 13450 – Instrumentation, Control and Monitoring System Testing Requirements.
- B. General: Train the Owner's personnel on the maintenance, calibration and repair of all instruments provided under this Contract.
- C. Instructions: The training shall be performed by qualified representatives of the equipment manufacturers and shall be specific to each piece of equipment.
- D. Duration: Each training class shall be a minimum of 8 hours in duration and shall cover, as a minimum, operational theory, maintenance, troubleshooting/repair, and calibration of instruments. Include a minimum of 4 hours training per instrument or control device; for PLC, and software include 8 hours for each type supplied. Include a total of four (4) classes with two (2) shifts each.
- E. Schedule: Training shall be performed during the pre-commissioning phase of the project and 30 days after acceptance. The training sessions shall be scheduled a minimum of 3 weeks in advance of when the courses are to be initiated. The Owner and Engineer will

review the course outline and the training manual as submitted by the CSI for suitability and provide comments that shall be incorporated.

- F. Agenda: The training shall include operation and maintenance procedures, troubleshooting with necessary test equipment, and changing set points, and calibration for that specific piece of equipment.
- G. Documentation: Within 10 days after the completion of each session the Contractor shall submit the following:
 - 1. List of all Owner personnel who attended the session.
 - 2. Evaluation of Owner personnel via written testing or equivalent evaluation.
 - 3. Copy of the training materials used including all notes, diagrams, video presentation, and comments.

3.10 ACCEPTANCE

- A. For the purpose of this Section, the following conditions shall be fulfilled before the Work is considered substantially complete:
 - 1. All submittals have been completed and approved.
 - 2. The ICM system has been calibrated, loop tested and pre-commissioned.
 - 3. The Owner training has been performed.
 - 4. All required spare parts and expendable supplies and test equipment have been delivered to the Owner.
 - 5. The performance test has been successfully completed.
 - 6. All punch-list items have been corrected.
 - 7. All record drawings in both hard copy and electronic format have been submitted.
 - 8. Revisions to the operations and maintenance manuals information that may have resulted from the field tests have been made and reviewed.
 - 9. All debris associated with installation of instrumentation has been removed.
 - 10. All probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

3.11 WARRANTY

- A. Supplier shall warrant design, materials, and workmanship for customary period applicable for the equipment involved, but in no case for less than 24 months from date of acceptance, in accordance with the requirements of Paragraph 1.03, J, 1.
- B. During warranty period, if mechanical defects occur, or equipment fails to perform in accordance with specified performance requirements under conditions of normal use within the design limitations of the equipment, supplier shall, upon request of the company,

repair or replace equipment or parts as required and shall place equipment in proper working condition, assuming all expenses involved.

- C. A written prepaid maintenance contract executed by the CSI shall be provided to the Owner for on-site warranty and travel maintenance services, in accordance with the requirements of Paragraph 1.03, H, and Paragraph I, 1. This maintenance contract shall include all travel and living expenses, labor, parts, and emergency calls providing on-site response within 4 hours, to provide complete system maintenance for a period of one year after the date of final acceptance of the system.
- D. The maintenance contract shall include a minimum of 4 (quarterly) preventive maintenance visits by a qualified serviceman of the Supplier who is familiar with the type of equipment and software provided for this project. Each preventive maintenance visit shall include routine adjustment, calibration, cleaning, and lubrication of system equipment and written verification of calibration and correct software operation.
- E. An annual fee shall be quoted 90 days before completion of the first year maintenance contract for annual maintenance subsequent to the first year of operation. Standard per diem rates for providing breakdown service shall be set forth in the contract. Such rates shall be fair and reasonable and reflect the lowest rates offered to most favored customers. The fee quoted shall be firm for a minimum of 90 days from day of issue.

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INSTRUMENTATION, CONTROL AND MONITORING
SYSTEM TESTING REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. The Contractor shall test the Instrumentation, Control and Monitoring (ICM) System as specified herein to demonstrate compliance with the Contract Documents.
- B. Related Sections include but are not necessarily limited to
 - 1. Section 40 90 00 - Instrumentation, Control and Monitoring System General Requirements.
 - 2. Section 26 08 00 - Acceptance Testing and Calibration.

1.02 SUBMITTALS

- A. For each of the specified tests, submit a test plan to the Engineer at least one month in advance of commencement of the tests, in accordance with the requirements of Section 01 30 00 - Submittals. The test plan shall contain the following at a minimum:
 - 1. A schedule of all testing to be conducted.
 - 2. A brief description of the testing to be performed.
 - 3. Test objectives.
 - 4. Testing criteria per the Specifications.
 - 5. Check lists and procedures for performing each of the specified tests.
 - 6. Sample test result documentation.
 - 7. Requirements for other parties.

1.03 INSTRUMENTATION, CONTROL AND MONITORING SYSTEM TESTING - GENERAL

- A. All system start-up and test activities shall follow detailed test procedures; check lists, etc., previously approved by the Engineer. The Engineer shall be notified at least 21 days in advance of any system tests and reserves the right to have the Engineer or the Owner in attendance.
- B. The Contractor shall provide the services of experienced factory trained technicians, tools and equipment to field calibrate, test, inspect, and adjust all equipment in accordance with manufacturer's specifications and instructions.
- C. The Contractor shall maintain master logbooks for each phase of installation, startup and testing activities specified herein. Each logbook shall include signal, loop or control strategy tag number, equipment identification, description and space for sign-off dates, Contractor

signature and Engineer signature. Example test documentation specific to each phase of testing shall be approved prior to initiation of that testing, as specified hereinabove.

- D. All test data shall be recorded on test forms, previously approved by the Engineer. When each test has been successfully completed, a certified copy of all test results shall be furnished to the Engineer together with a clear and unequivocal statement that all specified test requirements have been met and that the system is operating in accordance with the Contract Documents.
- E. The Engineer will review test documentation in accordance with the Contract Documents and will give written notice of the acceptability of the tests within 10 days of receipt of the test results.

1.04 INSTRUMENTATION, CONTROL AND MONITORING SYSTEM FACTORY ACCEPTANCE TEST

- A. The Instrumentation, Control and Monitoring System equipment shall not be shipped until the Contractor receives written notice of acceptability of the factory tests.
- B. Each item of equipment shall be fully factory inspected, calibrated and tested for function, operation and continuity of circuits. Exceptions shall be approved in writing by the Engineer.
- C. Each subsystem shall be fully factory tested for function and operation. As a minimum, all tests shall conform to "Hardware Testing of Digital Process Computers", recommended practice RP55.1. Instrument Society of America.
- D. System performance shall be tested using a fully integrated system, including all software and hardware. To achieve this, the entire control system, including all peripheral devices and all interconnecting cables (field instruments are not included in this requirement), shall be assembled on the factory test floor and the complete operational program loaded and simulated inputs applied.
- E. The instrumentation subcontractor shall perform a 100-hour full system test, during which the entire system shall operate continuously without failure in accordance with the requirements of the Contract Documents. If a system component fails during the test, the 100-hour test period shall be restarted after its operation is restored.
- F. The factory testing shall demonstrate all aspects of system sizing and timing including:
 - 1. Monitoring and control scan times at the PLC level.
 - 2. Response times at the operator workstation level.
- G. The overall system shall be tested at maximum and minimum input power voltage variation. Noise shall be imposed on the lines connected to the equipment to demonstrate that the units can operate in a noisy environment.
- H. Operator Workstation Operation - This demonstration shall provide proof of system operation on an individual subsystem basis first, and then in the expected operating environment. Both normal and abnormal operating modes shall be demonstrated. Operator workstation testing shall include the following:

1. Run all manufacturer's diagnostics to prove reliable subsystem operation. In the case of the CPU, this shall include hardware diagnostics, as well as demonstration of the manufacturer's system software (operating system, communications, database, etc.).
 2. Demonstrate proper operation, under both normal and abnormal conditions of the operator workstation application software (SCADA, remote alarm dial-up, etc.). This shall include demonstration of system on-line diagnostics, fail-over features, reconfiguration operations, system initialization and restart, software fault tolerance, error detection and recovery, communications, and all additional features necessary to assure the successful operation of the system.
 3. Demonstrate the standard features of the system. This shall include proof of operation of the process control database generator, the display generator, data storage and retrieval functions, data acquisition and control, trending functions, and reporting functions.
 4. Demonstrate the configuration of the system to verify conformance with the Contract Documents. This shall include graphic displays and vectoring, operator interface functions, trending, reports, alarm management, security system configuration, etc.
 5. The system shall be operated with data input/output with the PLC's and associated panels to prove operation of all workstation functions.
 6. The testing in Paragraphs 3 and 4 above may be performed concurrently (i.e., the standard and configured features of the system may be demonstrated simultaneously).
- I. PLC Operation - All functions comparable to those demonstrated for the operator workstations shall be demonstrated on the PLCs. This shall include the following:
1. On-line and off-line diagnostics.
 2. For redundant units, fail-over operation and reconfiguration.
 3. System initialization and restart.
 4. Peer-to-peer communications.
 5. Non-volatility of memory.
 6. Operation of the control logic shall be demonstrated as described herein.
- J. Process I/O Simulation - Process input/output simulation for PLC's shall be performed with a manual simulation control panel, a separate programmable logic controller, network-based simulation software, analog signal generators, and/or jumpering of discrete signals between outputs and associated inputs, or some combination of these. Alternate process I/O systems such as plug-in circuit cards or I/O test modules may be utilized subject to approval by the Engineer to provide the specified simulation functions. The simulation system shall provide analog and discrete I/O hardware devices in sufficient quantity to allow complete and thorough testing of the control strategies and functions of the system. The process I/O simulation system shall be used in several ways as follows:
1. To provide a means of communications checkout from the operator work stations through the various levels of software in the PLC's and to the process, i.e., the

simulation panel. Likewise, a discrete or analog input shall be initiated from the simulation panel and the result monitored at the workstations.

2. Alarm response to discrete status changes or analog value limits shall be verified. Database entries or attributes such as engineering units and conversion equations shall be verified by varying analog inputs.
 3. To provide data for use at all levels of the control system at the time of system integration.
- K. Control Strategy Testing - Provision shall be made to test all control strategies to prove the integrity of each strategy and the process control language in which it is implemented. For each control strategy, all functions shall be tested individually (where possible) and collectively to verify that the control strategy performs as described herein and as required for overall functionality within the control system.
- L. Verification of proper operation and alarming when system or device supply power failure occurs and/or communication failures occur, shall be demonstrated during factory and site acceptance testing. System shall be programmed as required by plant staff to indicate failure, and to recover as needed.

1.05 INSTRUMENTATION AND CONTROL SYSTEM FIELD TESTING

A. General Requirements

1. Control system start-up and testing shall be performed to ensure that all plant processes shall be systematically and safely placed under digital control in the following order:
 - a. Primary elements such as transmitters and switch devices shall be calibrated and tested as specified herein.
 - b. Each final control element shall be individually tested as specified hereinafter.
 - c. Each control loop shall be tested as specified hereinafter.
 - d. Each control strategy shall be tested under automatic digital control as specified hereinafter.
 - e. The entire control system shall be tested for overall monitoring, control, communications, and information management functions, and demonstrated for system availability as specified hereinafter.
2. System start-up and test activities shall include the use of water, if necessary, to establish service conditions that simulate, to the greatest extent possible, normal operating conditions in terms of applied process loads, operating ranges and environmental conditions.
3. Each phase of testing shall be fully and successfully completed and all associated documentation submitted and approved prior to the next phase being started. Specific exceptions are allowed if written approval has been obtained in advance from the Engineer.

B. Contractor's Responsibilities

1. The Contractor shall ensure that all equipment, equipment control panels, local control panels, field instrumentation, control system equipment and related equipment and/or systems are tested for proper installation, adjusted and calibrated on a loop-by-loop basis prior to control system startup to verify that each is ready to function as specified. Each test shall be witnessed, dated and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.
2. The Contractor shall be responsible for coordination of test meetings. A meeting shall be held each morning to review the day's test schedule with all participants. Similarly, a meeting shall be held each evening to review the day's test results and to review or revise the next day's test schedule as appropriate.
3. The Contractor shall ensure that the electrical Work conforms to the start-up, test and sign-off procedures specified herein to assure proper function and coordination of all motor control center control and interlock circuitry and the transmission of all discrete and/or analog signals between other equipment and the control system specified herein.
4. The Contractor shall coordinate the start-up, test and sign-off procedures specified herein to assure proper function and coordination of all motor control center control and interlock circuitry and the transmission of all discrete and/or analog signals between equipment furnished under Division 16 and the control system specified herein.

C. Final Control Element Testing

1. The proper control of all final control elements shall be verified by tests conducted in accordance with the requirements specified herein.
2. All modulating final control elements shall be tested for appropriate speed or position response by applying power and input demand signals and observing the equipment for proper direction and level of reaction. Each final control element shall be tested at 0, 25, 50, 75, and 100 percent of signal input level and the results checked against specified accuracy tolerances. Final control elements, such as VFD's, that require turndown limits shall be initially set during this test.
3. All non-modulating final control elements shall be tested for appropriate position response by applying and simulating control signals and observing the equipment for proper reaction.

D. Loop Checkout

1. Prior to control system startup and testing, each monitoring and control loop shall be tested on an individual basis from the primary element to the final element, including the operator workstation or loop controller level, for continuity and for proper operation and calibration.
2. Signals from transducers, sensors, and transmitters shall be utilized to verify control responses. Simulated input data signals may be used subject to prior written approval by the Engineer. All modes of control shall be exercised and checked for proper operation.

3. The accuracy of all Digital to Analog Conversions (DACs) shall be verified by manually entering engineering unit data values at the operator workstation and then reading and recording the resulting analog output data.
4. The accuracy of all Analog to Digital Conversions (ADCs) shall be verified using field inputs or by manually applying input signals at the final controller, and then reading and recording the resulting analog input data at the operator workstation.
5. Each loop tested shall be witnessed, dated and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

E. Control System Startup and Testing

1. Control system startup and testing shall be performed to demonstrate complete compliance with all specified functional and operational requirements. Testing activities shall include the simulation of both normal and abnormal operating conditions.
2. All digital hardware shall be fully inspected and tested for function, operation and continuity of circuits. All diagnostic programs shall be run to verify the proper operation of all digital equipment.
3. Final control elements and ancillary equipment shall be tested under start-up and steady-state operating conditions to verify that proper and stable control is achieved using local area control panels, motor control center circuits, and local field mounted control circuits. All hardwired control circuit interlocks and alarms shall be operational. The control to final control elements and ancillary equipment shall be tested using both manual and automatic (where provided) control circuits.
4. Signals from transducers, sensors, and transmitters shall be utilized to verify control responses for final control elements. Simulated input data signals may be used subject to prior written approval by the Engineer.
5. Each control strategy shall be tested to verify the proper operation of all required functions. The control system start-up and test activities shall include procedures for tuning all control loops incorporating PID control modules, and for adjusting and testing all control loops as required to verify specified performance.
6. The control system start-up and test activities shall include running tests to prove that the Instrumentation, Control and Monitoring System is capable of continuously, safely and reliably regulating processes, as required by the Contract, under service conditions that simulate, to the greatest extent possible, normal plant operating ranges and environmental conditions.
7. A witnessed functional acceptance test shall be performed to demonstrate satisfactory performance of individual monitoring and control loops and control strategies. At least one test shall be performed to verify that the control and instrumentation system is capable of simultaneously implementing all specified operations.
8. Each loop and control strategy test shall be witnessed and signed off by both the Contractor (or designee) and the Engineer upon satisfactory completion.

F. Facility Startup Coordination

1. Facility start-up shall comply with requirements specified in the Contract Documents and those requirements specified herein. Facility start-up shall commence after all previously described start-up and test activities have been successfully completed and shall demonstrate that the Instrumentation, Control and Monitoring System can meet all Contract requirements with equipment operating over full operating ranges under actual operating conditions.
2. The control system start-up period shall be coordinated with process startup activities and shall be extended as required until all plant processes are fully operational and to satisfy the Engineer that all control system Contract requirements have been fulfilled in accordance with the Contract Documents.
3. The instrumentation subcontractor's personnel shall be resident at the facility to provide both full time (eight hours/day, five days/week) and 24 hours on call (seven days/week) support of operating and maintenance activities for the duration of the start-up period.
4. At least one qualified control systems technician shall be provided for control system startup and test activities (at least two when loop checkout is being performed).

1.06 INSTRUMENTATION, CONTROL AND MONITORING SYSTEM FINAL ACCEPTANCE TEST

- A. Upon completion of all control system startup activities and prior to final system acceptance, the Contractor shall demonstrate that the availability of the entire control system, including operation under conditions of digital equipment fail-over, initiated either automatically or manually, shall be not less than 99.8 percent during a 30-day availability test period. The Engineer shall be given two (2) weeks notice of the starting date of the 30-day availability test.
- B. For purposes of determining availability figures, downtime of each system or portions of each system resulting from the causes specified hereunder will not be considered system failures.
 1. Downtime of any data highway connected device that is automatically backed-up upon failure shall not be considered a system failure provided that the downtime of the failed component does not exceed 24 hours.
 2. Downtime of a PLC that is not automatically backed-up shall be considered a system failure if the downtime of the failed controller exceeds one (1) hour.
 3. Downtime of a portion of the system resulting from failure of any field sensor shall not be considered a system failure provided that the system operates as specified under this condition.
 4. Downtime of the following devices shall not be considered a system failure provided the failed device is repaired within the specified time:
 - a. Hard disc and moving head memory (one day)
 - b. Workstations (one day)
 - c. Communications interfaces (eight hours)

5. Total shutdown of a single PLC resulting from a software fault shall be considered a system failure.
 6. An erroneous command to the process that can be specifically related to a software fault shall be considered as one (1) hour of downtime.
 7. The inoperability of any subsystem resulting from a software fault shall be considered a system failure.
 8. The failure of the same component more than one time during the 30-day test shall be considered a system failure.
- C. If the system fails the 30-day availability test, the 30-day test period shall be restarted after the failed component or software is repaired/replaced and full operation is restored.
- D. The Contractor shall submit an availability demonstration report that shall state that all system availability requirements have been met.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

- END OF SECTION -