

PROJECT MANUAL

GRANGER PARK STORMWATER IMPROVEMENTS



**CITY OF LAGRANGE
LAGRANGE, GEORGIA**

SEPTEMBER 2020

GRANGER PARK STORMWATER IMPROVEMENTS



CITY OF LAGRANGE
LAGRANGE, GEORGIA

SPECIFICATIONS

<u>Section</u>	<u>Title</u>
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Division 00 – Procurement and Contracting Requirements

00 11 16	Advertisement for Bids
00 21 13	Instructions to Bidders
00 22 13	Supplemental Instructions to Bidders
00 41 00	Bid Form
00 43 13	Bid Bond
00 43 39.13	Local and MBE/WBE Agreement
00 43 39.16	Statement of Local and Minority Owned Firm Utilization
00 45 13	Statement of Bidder's Qualifications
00 45 19	Non-Collusion Affidavit of Prime Bidder
00 45 53	Corporate Certificate
00 45 63	Drug-Free Workplace Certificate
00 45 75	Georgia Security and Immigration Compliance Act Affidavits
00 45 77	Contractor's License Certification
00 52 00	Agreement
00 54 43	Pre-Award Oath
00 54 45	Residency Status Affidavit
00 61 13.13	Performance Bond
00 61 13.16	Payment Bond
00 72 00	General Conditions
00 73 00	Supplementary Conditions

Division 01 – General Requirements

01 11 00	Summary of Work
01 14 16	Occupancy
01 22 00	Measurement and Payment
01 25 00	Substitution Procedures
01 29 73	Schedule of Values
01 31 19	Project Meetings
01 32 16	Construction Schedules
01 32 33	Construction Videos and Photographs
01 33 00	Submittal Procedures
01 35 00	Unique Requirements
01 41 00	Regulatory Requirements
01 42 00	Codes and Standards
01 45 29	Testing Laboratory Services
01 50 00	Temporary Facilities and Controls
01 56 33	Job Site Security
01 65 00	Product Delivery Requirements
01 66 00	Product Storage and Handling Requirements
01 71 23.13	Construction Layout
01 74 00	Cleaning and Waste Management
01 78 36	Warranties
01 78 39	Record Documents

Division 02 – Existing Conditions

02 41 00 Demolition

Division 03 – Concrete

03 11 00 Concrete Formwork
03 15 00 Concrete Accessories
03 20 00 Concrete Reinforcement
03 30 00 Cast in Place Concrete (Concrete Work)

Division 31 – Earthwork

31 10 00 Site Clearing
31 11 00 Clearing and Grubbing
31 20 00 Earth Moving
31 23 19.16 Dewatering
31 23 33 Trenching and Backfilling

Division 32 – Exterior Improvements

32 10 13 Removing and Replacing Pavement
32 11 13 Subgrade Construction and Preparation
32 12 16 Asphalt Concrete Paving
32 16 00 Concrete Sidewalks and Curbs and Gutters
32 31 13.10 PVC Coated Galvanized Chain Link Fences and Gates
32 92 19 Seeding

Division 33 – Utilities

33 01 48 Temporary Bypass Pumping System
33 05 61 Manholes and Covers
33 31 00 Sanitary Sewer Utility Piping
33 40 00 Storm Drainage Utilities
33 42 16 Precast Reinforced Concrete Box Culverts and Accessories
33 44 13.16 Inlets

GRANGER PARK STORMWATER IMPROVEMENTS

**CITY OF LAGRANGE
LAGRANGE, GEORGIA**

Sealed Bids for furnishing all materials, labor, tools, equipment and appurtenances necessary for the construction of the Granger Park Stormwater Improvements will be received at City of LaGrange, 200 Ridley Avenue, LaGrange, Georgia 30240, until 2 p.m., local time, on October 22, 2020, and then at said location publicly opened and read aloud.

The Project consists of de-watering and re-grading Granger Park Stormwater Pond (removing approximately 13,000 cubic yards of soil), modifications to the outlet control structure, removing and replacing a failing 85-inch x 64-inch corrugated metal pipe with a 7'x5' concrete box culvert (approximately 900 LF) with associated structures, minor sanitary sewer improvements, concrete replacement, and all other related items.

The work will be awarded in 1 Contract.

The Instructions to Bidders, Bid, Contract Agreement, Drawings, Specifications and forms of Bid Bond, Performance Bond, Payment Bond and other Contract Documents may be examined at the following:

City of LaGrange
200 Ridley Avenue
LaGrange, Georgia 30240

Barge Design Solutions, Inc
1201 Front Avenue, Suite F
Columbus, GA 31901
706-321-4590

Electronic copies of Bidding Documents may be obtained from Barge Design Solutions, Inc. by contacting Jessica Kimbrel at Jessica.kimbrel@bargedesign.com or via phone at (706) 321-4590. There is no cost for electronic Bidding Documents.

Each Bid must be accompanied by a Bid Bond, prepared on the form of Bid Bond attached to the Contract Documents or a Surety Company's Standard Bid Bond, duly executed by the Bidder as principal and having as surety thereon a surety company licensed to do business in the State of Georgia and listed as a certified company in the latest issue of U.S. Treasury Circular 570, in the amount of five percent of the Bid.

No bid may be withdrawn within 60 calendar days after the scheduled time for receipt of bids.

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 Invitation to Bid.

The successful Bidder for this Contract will be required to furnish a satisfactory Performance Bond and Payment Bond each in the amount of 100 percent of the Bid.

The Owner reserves the right to reject all Bids, to waive informalities and to readvertise.

City of LaGrange
Meg Kelsey
City Manager

END OF SECTION

ARTICLE 1 – DEFINED TERMS

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

- A. *Issuing Office* – The office from which the bidding procedures are to be administered. The issuing office for this Project is as stated in the Advertisement for Bids.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the advertisement or invitation to bid may be obtained from the Issuing Office, or its designated printing facility, as indicated in the Advertisement for Bids.

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

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

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 The minimum qualifications of a responsible Bidder includes the following requirements:

- A. The Bidder shall maintain a permanent place of business. This requirement applies to the Bidder where the Bidder is a division of a corporation, or where the Bidder is 50 percent or more owned by a person, corporation or firm.
- B. The Bidder is licensed by the State of Georgia to perform the work under this contract.
- C. The Bidder shall demonstrate adequate construction experience and sufficient equipment resources to properly perform the work under and in conformance with the Contract Documents. This evaluation will be based upon a list of completed or active projects and a list of construction equipment available to the Bidder to perform the work. The Owner may make such investigations as deemed 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 reasonably request. 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 Project contemplated therein. Adequate construction experience, for the purposes of this Project, may be defined in the Supplemental Instructions to Bidders.
- D. The Bidder shall demonstrate financial resources of sufficient strength to meet the obligations incident to the performance of the work covered by these Contract

Instructions to Bidders

Documents. The ability to obtain the required Performance and Payment Bonds will not alone demonstrate adequate financial capability.

- E. The Bidder shall demonstrate that he is familiar with the work covered by these Contract Documents.
- 3.02 To demonstrate Bidder's qualifications to perform the Work and as evidence of adequate construction experience, Bidder shall submit with the Bid written evidence such as previous experience, present commitments, and such other data as may be called for below.
- A. Completion of Statement of Bidder's Qualifications, as indicated in Section 00 45 13.
 - B. Bidder's Georgia Utility Contractor license, as indicated in Section 00 45 77.
- 3.03 To demonstrate Bidder's qualifications to perform the Work, within three days of Owner's request, Bidder shall submit written evidence such as financial data and such other data as may be requested by Owner.
- 3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.
- 3.05 A Bidder may be deemed as not responsible if:
- A. Bidder fails to furnish adequate information for the Owner to determine if the Bidder is deemed to possess adequate construction experience and sufficient equipment resources or fails to provide such information in a timely manner.
 - B. Bidder fails to furnish information, evidence, and statements of the principal owner when the Bidder is owned 50 percent or more by another firm, corporation, or person.
 - C. Bidder is in arrears on any existing contracts, interested in any litigation against the Owner or has defaulted on a previous contract.
 - D. Bidder fails to have access to adequate equipment.
 - E. Bidder has uncompleted work which in the judgment of the Owner will hinder or prevent prompt completion of additional work, if awarded.
- 3.06 Acceptance of the Bidder's documentation and substantiation or Contract Award by the Owner does not relieve the Bidder of liability for non-performance as covered in the Contract Documents, nor will the Bidder be exempted from any other legal recourse the Owner may elect to pursue.

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

4.01 *Subsurface and Physical Conditions*

- A. The Supplementary Conditions identify:

1. Those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site.
 2. Those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- B. Copies of reports and drawings referenced in Paragraph 4.01.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified and established in Paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 *Underground Facilities*

- A. Information and data shown or indicated in the Bidding 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, including Owner, or others.

4.03 *Hazardous Environmental Condition*

- A. The Supplementary Conditions identify any reports and drawings known to Owner relating to a Hazardous Environmental Condition identified at the Site.
- B. Copies of reports and drawings referenced in Paragraph 4.03.A will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the “technical data” contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any “technical data” or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

- 4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 4.06 of the General Conditions.

- 4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition

Instructions to Bidders

upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of contract documents (other than portions thereof related to price) for such other work.

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

- A. examine and carefully study the Bidding Documents, and the other related data identified in the Bidding Documents;
- B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;
- D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Paragraph 4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in the Paragraph 4.06 of the Supplementary Conditions as containing reliable "technical data";
- E. consider the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs;
- F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;
- G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

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

ARTICLE 5 – PRE-BID CONFERENCE

- 5.01 A Pre-Bid Conference will be held if so indicated in the Advertisement for Bids. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 – SITE AND OTHER AREAS

- 6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. 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.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

- 7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed, delivered or otherwise issued to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Oral and other interpretations or clarifications will be without legal effect.
- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.
- 7.03 Questions and other inquiries shall be submitted to the Issuing office, as indicated in the Supplemental Instructions to Bidders.

ARTICLE 8 – BID SECURITY

- 8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of five percent of Bidder's maximum Bid price and in the form of a Bid bond (on the form attached or on a surety company's standard bid bond form) issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

Instructions to Bidders

- 8.02 If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within ten days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.
- 8.03 Attorneys-in-Fact of other officers who sign bid bonds for a surety company must file with such bonds a certified copy of his power of attorney authorizing him to sign said bonds.

ARTICLE 9 – CONTRACT TIMES

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

ARTICLE 10 – LIQUIDATED DAMAGES

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

ARTICLE 11 – SUBSTITUTE AND “OR-EQUAL” ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents. No substitution requests will be considered.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute without an increase in the Bid.
- 12.02 *If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.*
- 12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

ARTICLE 13 – PREPARATION OF BID

- 13.01 The Bid Form is included with the Bidding Documents.
- 13.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid item and alternate item listed therein. In the case of optional alternatives the words “No Bid,” “No Change,” or “Not Applicable” may be entered.
- 13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown.
- 13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown.
- 13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.
- 13.06 A Bid by an individual shall show the Bidder’s name and official address.
- 13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The official address of the joint venture shall be shown.
- 13.08 All names shall be printed in ink below the signatures.
- 13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.
- 13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

ARTICLE 14 – BASIS OF BID; COMPARISON OF BIDS**14.01 *Lump Sum and Unit Prices***

- A. Bidders shall submit a bid on a lump sum or unit price basis, as indicated on the Bid schedule, for each item of Work listed in the Bid schedule.
- B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.
- C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.02 *Allowances*

Instructions to Bidders

- A. For cash allowances the various other Bid prices shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 11.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

15.01 With each set of the Bidding Documents, a Bidder is furnished one separate unbound copy of the required documents listed below. The Bidder shall complete and submit one original of all documents listed below in the envelope.

- A. Bid Form
- B. Bid Bond Form
- C. Local and MBE/WBE Agreement
- D. Statement of Local and Minority Owned Utilization
- E. Statement of Bidders Qualifications
- F. Non-Collusion Affidavit of Prime Bidder
- G. Drug-Free Workplace Certificate
- H. Corporate Certificate, if Bidder is a corporation
- I. Georgia Security and Immigration Compliance Act Affidavits
- J. Contractor's License Certification

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in a sealed envelope which shall also contain the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the place indicated in the Advertisement for Bids.

15.03 In addition to the requirements of Article 15.02 above, the Bidder shall provide on the outside of the envelope containing the bid the Bidder's name and "Bid for Granger Park Stormwater Improvements".

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 *If a Bidder, after the Bid opening determines that its Bid contained an appreciable error in the calculation of its Bid, the Bidder may withdraw its Bid, subject to the provisions of, and, if the mistake meets the criteria in, O.C.G.A. 36-91-52.*

- 16.03 A bid may be withdrawn after the time period stated in the Advertisement for Bids after the date of the opening of the bids, provided that the Bidder has not been notified within said time period that his bid has been accepted.

ARTICLE 17 – OPENING OF BIDS

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

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

- 19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also 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. 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.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 A bid may be declared by the Owner to be non-responsive for, but not limited to, any of the following reasons:
- A. Bid contains blanks, Proposal is not complete or required accompanying documents, certifications, and statements are not included.
 - B. Bid contains modifications or alterations of the Bid Form or other Contract Documents.
 - C. Bid is a qualified or conditional bid.
 - D. Bid contains unrealistic data, erroneous data, inaccurate data, or data that cannot be documented or substantiated.
- 19.05 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or

Instructions to Bidders

entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.06 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work in accordance with the Contract Documents.

19.07 The Contracts will be awarded to the responsive, responsible Bidders submitting the lowest Bid complying with the conditions of the Contract Documents and determination by the Owner of the Bidder's responsiveness and responsibility. Award will be made on the basis of the prices given in the Bid.

ARTICLE 20 – CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner or Engineer issues a Notice of Award to the Successful Bidder, the Notice of Award will be accompanied by the required number of unsigned counterparts of the Agreement along with the other Contract Documents, which are identified in the Agreement as attached thereto. Within ten days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

21.02 Upon failure of the Bidder to execute the required bonds or to sign the required contract within ten days after the contract is awarded, he will be considered to have abandoned his proposal and the Owner may annul the award. By reason of the uncertainty of market prices of materials and labor, and it being impracticable and extremely difficult to fix the amount of damages to which the Owner would be put by reason of said Bidder's failure to execute said bonds and contract within ten days, the bid security accompanying the proposal shall be the agreed amount of damages which the Owner will suffer by reason of such failure on the part of the Bidder and shall thereupon immediately be forfeited to the Owner. The filing of a proposal will be considered as an acceptance of this provision.

ARTICLE 22 – DELETED

ARTICLE 23 – RETAINAGE

23.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the Agreement.

ARTICLE 24 – DELETED

ARTICLE 25 – DELETED

ARTICLE 26 – PERMITS, EASEMENTS AND RIGHTS-OF-WAY

? 26.01 All anticipated federal, state, or local permits required for the Project, which are the responsibility of the Owner, have been obtained.

? 26.02. All rights-of-way and easements required for the Project, which are the responsibility of the Owner, have been obtained.

This document was prepared in part from material (EJCDC C-200 Suggested Instructions to Bidders for Construction Contracts) which is copyrighted as indicated below:

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1420 King Street, Alexandria, VA 22314-2794
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www.nspe.org

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

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

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
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www.agc.org

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ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 Paragraph C. following the last sentence, add the following,

Adequate construction experience, for the purposes of this Project, shall mean

1. The Bidder has successfully completed construction of 3 concrete box culvert projects including 7 foot by 5 foot box culverts or larger, and will utilize project superintendent with such experience.
2. The Bidder can demonstrate pond dredging/mucking out experience.
3. At least 50 percent of the labor related items on each Project must have been completed by the Applicant's own work force.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.03 Questions and other inquiries shall be submitted to the Issuing Office, Attention: Scott Thompson, scott.thompson@bargedesign.com.

ARTICLE 26 – PERMITS, EASEMENTS AND RIGHTS-OF-WAY

26.01 All anticipated federal, state, or local permits required for the Project, which are the responsibility of the Owner, have been obtained.

END OF SECTION

GRANGER PARK STORMWATER IMPROVEMENTS

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

City of LaGrange
200 Ridley Avenue
LaGrange, Georgia 30240

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

ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS

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

ARTICLE 3 – BIDDER’S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.
- D. Bidder has carefully studied all: (1) all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities)

- that have been identified in SC-4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."
- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
 - F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
 - G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
 - H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
 - I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
 - J. Where this Bid Form contains the provision for a bid based on a lump sum price, the Bidder shall be responsible for having prepared its own estimate of the quantities necessary for the satisfactory completion of the Work specified in these Contract Documents and for having based the lump sum price bid on its estimate of quantities.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

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

Item No.	Description	Qty.	Unit	Unit Price	Total Price
1	Erosion and Sedimentation Control				
a.	Construction Exit (Co)	2	EA	\$	\$
b.	Silt Fence Type "S" (Sd1-S)	2010	LF	\$	\$
c.	Hay Bales for Double Row Silt Fence Type "S" (Sd1-S)	1005	LF	\$	\$
d.	Inlet Protection (Sd2-F)	3	EA	\$	\$
e.	Tree Protection (Tr)	1130	LF	\$	\$
f.	Storm Drain Outlet Protection (St)	180	CY	\$	\$
g.	Stand Pipe Assembly Complete	1	EA	\$	\$
h.	Filter Ring (Fr)	1	EA	\$	\$
i.	Matting Blanket (Ss-R)	3370	SY	\$	\$
j.	Temporary Grassing - Seed & Mulch	2.1	AC	\$	\$
k.	Permanent Grassing – Sod	22570	SF	\$	\$
l.	Permanent Grassing –Seed & Mulch	1.30	AC	\$	\$
2	Storm Drain Structures				
a.	Box Culvert Weir Inlet	3	EA	\$	\$
b.	Box Culvert Manhole Access (Cover 18-Inches or Less)	3	EA	\$	\$
c.	GDOT Standard 2535 P Standard Precast Ends	2	EA	\$	\$
d.	62"X50" CMP Reconnection	1	EA	\$	\$

Item No.	Description	Qty.	Unit	Unit Price	Total Price
e.	Manhole Ring & Cover	5	EA	\$	\$
f.	Outlet Structure Modification Complete	1	EA	\$	\$
3	Storm Drain Pipe				
a.	5'X7' Concrete Box Culvert	845	LF	\$	\$
b.	24-inch DIP	20	LF	\$	\$
c.	Mirafi 140N Filter Fabric	100	SY	\$	\$
d.	Remove & Dispose Existing Pipe	860	LF	\$	\$
4	Sanitary Sewer				
a.	16-Inch DIP	90	LF	\$	\$
b.	8-inch DIP	20	LF	\$	\$
c.	24-Inch Steel Casing	70	LF	\$	\$
d.	16-inch Steel Casing	15	LF	\$	\$
e.	Reconnect to Existing Structure (16-Inch DIP)	2	EA	\$	\$
f.	Reconnect to Existing Structure (8-Inch DIP)	2	EA	\$	\$
g.	Shallow Foundation w/No Piers Complete	2	EA	\$	\$
5	Hardscape				
a.	Remove & Dispose Existing Concrete Sidewalk	9570	SF	\$	\$
b.	Concrete Sidewalk	10560	SF	\$	\$
c.	Remove & Dispose Wood Fence	230	LF	\$	\$
d.	Replace Wood Fence In-kind	230	LF	\$	\$

Item No.	Description	Qty.	Unit	Unit Price	Total Price
e.	Remove & Replace Chain Link Fence In-kind	60	LF	\$	\$
f.	Gravel Parking Area Restoration Complete	2880	SY	\$	\$
6	Pond Grading				
a.	Pond Grading Complete including Haul Off	1	LS	\$	\$
7	Cash Allowances				
a.	Soils & Concrete Testing	ALLOWANCE			\$ 10,000.00
b.	Unforeseen Work Elements	ALLOWANCE			\$ 20,000.00
c.	Landscape	ALLOWANCE			\$ 15,000.00
*****ADDITIONAL WORK IF ORDERED BY THE ENGINEER*****					
8	Remove and Replace Unsuitable Material				
a.	Removal of Unsuitable Backfill Material and Replace with Crushed Stone	150	CY	\$	\$
b.	Removal of Unsuitable Backfill Material and Replace with Suitable Earth Material	1200	CY	\$	\$

BID TOTAL, ITEMS 1 THROUGH 8, INCLUSIVE, THE AMOUNT OF _____

_____ DOLLARS (\$_____).

Bidder acknowledges Unit Prices have been determined in accordance with Paragraph 11.03.C of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 – TIME OF COMPLETION

- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 14.07 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

- 7.01 The following documents are submitted with and made a condition of this Bid:
- A. Bid Form
 - B. Bid Bond Form
 - C. Local and MBE/WBE Agreement
 - D. Statement of Local and Minority Owned Utilization
 - E. Statement of Bidders Qualifications
 - F. Non-Collusion Affidavit of Prime Bidder
 - G. Drug-Free Workplace Certificate
 - H. Corporate Certificate, if Bidder is a corporation
 - I. Georgia Security and Immigration Compliance Act Affidavits
 - J. Contractor's License Certification

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID DATA

- 9.01 The Bidder shall designate below the one Specialty Firm to perform the work type listed and one manufacturer for each product to be furnished and installed if awarded the work with the understanding that no changes or substitutions will be considered for these manufacturers unless directed by the Owner. The Bidder understands that if this information is not provided, offering products meeting all specification requirements and having the approval of the Engineer, then the Owner reserves the right either to determine the Bidder non-responsive and reject the Bid or to designate the manufacturer of the products to be provided which will meet all specification requirements, which Owner-designated manufacturer products must be furnished by the Bidder at no increase in the Contract Price.

Major Product or System Schedule		
Section	Description	Manufacturer/Supplier
Spec #	Spec title or product name	Mfgr 1 Mfgr 2 Mfgr 3
Spec #	Spec title or product name	Mfgr 1 Mfgr 2 Mfgr 3
Spec #	Spec title or product name	Mfgr 1 Mfgr 2 Mfgr 3
Spec #	Spec title or product name	Mfgr 1 Mfgr 2 Mfgr 3
Spec #	Spec title or product name	Mfgr 1 Mfgr 2 Mfgr 3
Spec #	Spec title or product name	Mfgr 1 Mfgr 2 Mfgr 3

ARTICLE 10 – BID SUBMITTAL

10.01 This Bid submitted by:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)

(Individual's signature)

Doing business as: _____

Attest: _____

(Notary)

Name (typed or printed): _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____

(Signature of general partner – attach evidence of authority to sign)

Name (typed or printed): _____

Attest: _____

(Signature of another Partner)

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____

(Signature)

Name (typed or printed): _____

Title: _____

(CORPORATE SEAL)

Attest: _____

(Signature of Corporate Secretary)

Name (typed or printed): _____

A Joint Venture

Name of Joint Venturer: _____

First Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of first joint venture partner)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of second joint venture partner)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

All Bidders shall complete the following:

Bidder's Business address: _____

Phone: _____ Facsimile: _____

Primary Contact: _____

Primary Contact E-mail: _____

Submitted on: _____, 20____.

This document was prepared in part from material (EJCDC C-410 Suggested Bid Form for Construction Contracts) which is copyrighted as indicated below:

Copyright © 2007 National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

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

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

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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

BIDDER (Name and Address):

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

OWNER (Name and Address):

City of LaGrange
200 Ridley Avenue
LaGrange, Georgia 30240

BID

Bid Due Date:
Description (Project Name): Granger Park Stormwater Improvements

BOND

Bond Number:
Date (Not earlier than Bid due date):
Penal sum _____ \$ _____
(Words) (Figures)

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

BIDDER

SURETY

Bidder's Name and Corporate Seal (Seal) Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

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

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from 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. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

Local and MBE/WBE Agreement

I, _____, hereby certify that I am _____ of the named Bidder in the foregoing Bid; that I have read the requirements of the Contract Documents related to local, MBE/WBE utilization for the Project, and hereby agree to comply with all requirements of the Contract Documents related to issuance of the Notice of Award.

BIDDER: _____

By: _____

(name signed)

(name printed or typed)

Title: _____

Date: _____

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

NOTARY PUBLIC: _____

(name signed)

(name printed or typed)

Commission Expires: _____

(date)

(SEAL)

END OF SECTION

Statement of Local and Minority Owned Firm Utilization

The Bidder shall list all subcontractors, including minority, women and local owned firms providing subcontracting services, furnishing products or materials, etc., to be utilized in the performance of the work. This list shall be submitted in the following format:

Subcontractor (Name & Address)	Nature of Work to be Contracted	Group (Local, MBE/WBE)	Anticipated Cost of Services (\$ Value, %)	
			\$	
				%
			\$	
				%
			\$	
				%
			\$	
				%
			\$	
				%

NOTE: Any proposed changes from the above list shall be submitted in writing to the Owner prior to initiation of the action, with the reason for the proposed deviation.

END OF SECTION

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. (Sample "Project Information Form" contained at the end of this Section.)

1. Name of Bidder: _____

2. Permanent main office address and phone number: _____

3. When organized: _____

4. If a Corporation, where incorporated: _____

5. How many years have you been engaged in the contracting business under your present firm or trade name? _____

6. Contracts on hand. (Complete a "Project Information Form", or provide same required information in a similar format, for each Contract on hand.)

7. General description of type of work performed by your company: _____

8. Have you ever failed to complete any work awarded to you? If so, where and why? _____

9. Have you ever defaulted on a contract? If so, where and why? _____

10. Attach a list of the most important projects recently completed by your company which are similar in scope to this Project. (Complete a "Project Information Form", or provide same required information in a similar format, for each Project listed.)

11. Names, background and experience of the principal members of your organization, including officers:

Name	Position	Years Experience
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Statement of Bidder's Qualifications

12. 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 Bidder, and that the answers to the foregoing questions and statements contained therein are true and correct.

BIDDER: _____

By: _____
(name signed)

(name printed or typed)

Title: _____

Date: _____

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

NOTARY PUBLIC: _____
(name signed)

(name printed or typed)

Commission Expires: _____
(Date)

(SEAL)

Project Information Form

Project Title: _____

Project Description: _____

Major Subcontractors: _____

Major Suppliers: _____

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

Non-Collusion Affidavit of Prime Bidder

STATE OF _____

COUNTY OF _____

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

He or she is _____

(Owner, Partner, Officer, Representative or Agent)

of _____, 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 City of LaGrange 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.

BIDDER: _____

By: _____

(name signed)

(name printed or typed)

Title: _____

Date: _____

Subscribed and sworn to me this ___ day of _____, 20___

NOTARY PUBLIC: _____

(name signed)

(name printed or typed)

Commission Expires: _____

(SEAL)

END OF SECTION

Section 00 45 53
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

Drug-Free Workplace Certificate

By signature on this certificate, the Bidder/Contractor agrees to comply with and accepts the provisions of O.C.G.A. Section 50-24-1 through 50-24-6, the "Drug-free Workplace Act". The Contractor certifies that:

1. A drug-free workplace will be provided for the Contractor's employees during the performance of the Contract; and
2. Each Contractor who hires a subcontractor to work in a drug-free workplace shall secure from that subcontractor the following written certification: "As part of the subcontracting agreement with _____ (Contractor's name), _____ (subcontractor's name) certifies to the Contractor that a drug-free workplace will be provided for the subcontractor's employees during the performance of this Contract pursuant to paragraph (7) of subsection (b) of Code Section 50-24-3".

By signature on this certificate, the Bidder/Contractor further certifies that it will not engage in the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana during the performance of the Contract.

Bidder/Contractor: _____

By: _____

(name signed)

(name printed or typed)

Title: _____

Date: _____

END OF SECTION

Georgia Security and Immigration Compliance Act Affidavits

City of LaGrange (Owner) and Contractor agree that compliance with the requirements of O.C.G.A. 13-10-91 and Rule 300-10-1 of the Rules of the Georgia Department of Labor (DOL) are conditions of this Agreement for the physical performance of services.

The Contractor further agrees that its compliance with the requirements of O.C.G.A. 13-10-91 and DOL Rule 300-10-1-.02 is attested to on the executed Contractor Affidavit and Agreement attached hereto as EXHIBIT A.

If employing or contracting with any subcontractor(s) in connection with this Agreement, Contractor further agrees:

- (1) To secure from the subcontractor(s) such subcontractor(s)' indication of the employee-number category applicable to the subcontractor(s); and
- (2) To secure from the subcontractor(s) an affidavit attesting to the subcontractor's compliance with O.C.G.A. Sec. 13-10-91 and DOL Rule 300-10-1; such affidavit being in the form attached hereto and referenced as EXHIBIT A-1; and
- (3) To submit such subcontractor affidavit(s) to the Owner when the subcontractor(s) is retained, but in any event, prior to the commencement of work by the subcontractor(s).

The Contractor shall check, initial or otherwise affirmatively indicate below the employee-number category applicable to the Contractor:

- 500 or more employees
- 100 or more employees
- fewer than 100 employees

The failure of Contractor to supply the affidavit of compliance at the time of execution of this Agreement and/or the failure of Contractor to continue to satisfy the obligations of O.C.G.A. 13-10-91 and DOL Rule 300-10-1 as set forth in this Agreement during the term of the Agreement shall constitute a material breach of the contract. Upon notice of such breach, Contractor shall be entitled to cure the breach within ten days, upon providing satisfactory evidence of compliance with the terms of this Agreement and State law. Should the breach not be cured, the Owner shall be entitled to all available remedies, including termination of the contract and damages.

SEE AFFIDAVITS ON FOLLOWING PAGES

**CONTRACTOR AFFIDAVIT AND AGREEMENT
EXHIBIT A**

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 contracting with City of LaGrange, has registered with, is authorized to use and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91. The undersigned affirms that it is using and will continue to use the federal work authorization program throughout the contract period.

The undersigned further agrees that should it employ or contract with any subcontractor(s) for the physical performance of services pursuant to the contract with City of LaGrange, the Contractor will secure from the subcontractor(s) verification of compliance with O.C.G.A. § 13-10-91 on the attached Subcontractor Affidavit. (EXHIBIT A-1). The Contractor further agrees to maintain records of such compliance and shall provide a copy of each such verification to City of LaGrange, at the time the subcontractor(s) is retained to perform such services.

EEV / Basic Pilot Program* User Identification Number

BY: Authorized Officer or Agent

Date Signed

[Contractor Name]

Title of Authorized Officer or Agent of Contractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE

____ DAY OF _____, 20 ____

Notary Public
My Commission Expires: _____

**As of the effective date of O.C.G.A 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot program" operated by the the U.S. Citizenship and Immigration Service Bureau of the U.S. Department of Homeland Security. In conjunction with the Social Security Administration (SSA).*

**SUBCONTRACTOR AFFIDAVIT
EXHIBIT A-1**

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 City of LaGrange, has registered and is participating in a federal work authorization program* [any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security or any equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicability provisions and deadlines established in O.C.G.A. § 13-10-91.

EEV / Basic Pilot Program* User Identification Number

BY: _____
Authorized Officer or Agent

Date Signed

[Subcontractor Name]

Title of Authorized Officer or Agent of Subcontractor

Printed Name of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME ON THIS THE

____ DAY OF _____, 20____

Notary Public
My Commission Expires: _____

** As of the effective date of O.C.G.A 13-10-91, the applicable federal work authorization program is the "EEV / Basic Pilot Program" operated by the U.S. Citizenship and Immigration Service Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration.*

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

THIS AGREEMENT is by and between City of LaGrange (“Owner”) and
_____ (“Contractor”)

Owner and Contractor agree as follows:

ARTICLE 1 – WORK

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

Granger Park Stormwater Improvements

ARTICLE 2 – THE PROJECT

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

Granger Park Stormwater Improvements

ARTICLE 3 – ENGINEER

3.01 The Project has been designed by Barge Design Solutions, Inc. (Engineer), which is to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

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

4.02 *Days to Achieve Substantial Completion and Final Payment*

A. The Work will be substantially completed within 210 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 240 consecutive calendar days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the

delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time.

1. 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 \$500.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete.
 2. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$500.00 for each day that expires after the time specified in Paragraph 4.02 above for completion and readiness for final payment until the Work is completed and ready for final payment.
- B. Liquidated Damages associated with Substantial Completion, Final Completion and Milestones shall be additive and cumulative.

ARTICLE 5 – CONTRACT PRICE

- 5.01 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 5.01.A below:
- A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit, the sum of which is _____ (Dollars) (\$ _____).

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

- A. 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.

6.02 *Progress Payments; Retainage*

- A. Owner shall make progress payments on account of the Contract Price, on the basis of Contractor's Applications for Payment submitted and recommended for payment in accordance with Article 14 of the General Conditions, and as provided in Paragraph 6.02.A.1 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.
 1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidated damages, in accordance with Paragraph 14.02 of the General Conditions.
 - a. 90 percent of Work completed (with the balance being retainage).; and

- b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
 - c. If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage.
- B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.02.B.5 of the General Conditions and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 *Final Payment*

- A. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 – INTEREST

- 7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of one half percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities), if any, that have been identified in Paragraph SC-4.02 of the Supplementary Conditions as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Paragraph SC-4.06 of the Supplementary Conditions as containing reliable "technical data."

- E. Contractor has considered the information known to Contractor; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Contract Documents; and (3) Contractor's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 8.01.E above, Contractor does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

- A. The Contract Documents consist of the following:
 - 1. This Agreement.
 - 2. Performance bond.
 - 3. Payment bond.
 - 4. General Conditions.
 - 5. Supplementary Conditions.
 - 6. Specifications as listed in the table of contents of the Project Manual.
 - 7. Drawings as listed on the Index of Drawings, Legend & Abbreviations with each sheet bearing the following general title: Granger Park Stormwater Improvements.
 - 8. Addenda (numbers _____ to _____, inclusive), incorporated herein.
 - 9. Exhibits to this Agreement (enumerated as follows):

- a. Contractor's Bid, as shown in Section 00 41 00 of this Project Manual.
10. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
- a. Notice to Proceed.
 - b. Work Change Directives.
 - c. Change Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

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

10.02 *Assignment of Contract*

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

10.03 *Successors and Assigns*

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

10.04 *Severability*

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

10.05 *Contractor's Certifications*

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. Counterparts have been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or have been identified by Owner and Contractor or on their behalf.

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

Approved as to Form Before Execution:

By: _____
Signature

Printed Name

Title: Attorney for Owner

OWNER:

City of LaGrange

By: _____
Signature

Meg Kelsey

Title: City Manager

CONTRACTOR

By: _____
Signature

Printed Name

Title: _____

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

Attest: _____
Signature

Printed Name

Title: _____

Address for giving notices:

200 Ridley Avenue

LaGrange, Georgia 30240

Attest: _____
Signature

Printed Name

Title: _____

Address for giving notices:

This document was prepared in part from material (EJCDC C-520 Suggested Form of Agreement Between Owner and Contractor for Construction Contract (Stipulated Price)) which is copyrighted as indicated below:

Copyright © 2007 National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

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

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

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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STATE OF GEORGIA

COUNTY OF TROUP

In accordance with O.C.G.A. §36-91-21(e), we, the undersigned of

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

We have not directly or indirectly violated O.C.G.A. §36-91-21 (d), and more specifically, we 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.

We, the undersigned, to the best of our knowledge, affirm 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
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(Notary Public) My Commission Expires: _____

(SEAL)

END OF SECTION

Residency Status Affidavit

**Affidavit Verifying Residency Status of an Applicant as Required by
The Georgia Security and Immigration Compliance Act**

By executing this affidavit under oath, as an applicant for a City of LaGrange contract or other public benefit as referenced in the Georgia Security and Immigration Compliance Act (O.C.G.A. § 50-36-1), I am stating the following with respect to my application and award for a contract with City of LaGrange.

_____ **I am a United States citizen**

OR

_____ **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.***

Attach a copy of the document verifying your status (front and back) to this Affidavit.

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

Applying on Behalf of/Name of Associated Business

SUBSCRIBED AND SWORN BEFORE ME
ON THIS ____ 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.

END OF SECTION

Section 00 61 13.13

Performance Bond

CONTRACTOR (name and address):

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

OWNER (name and address):

City of LaGrange
200 Ridley Avenue
LaGrange, Georgia 30240

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description: Granger Park Stormwater Improvements

BOND

Bond Number:
Date (not earlier than the Effective Date of the Agreement of the Construction Contract):
Amount:

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

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (seal)

Surety's Name and Corporate Seal (seal)

By: Signature

By: Signature (attach power of attorney)

Printed Name

Printed Name

Title

Title

Attest: Signature

Attest: Signature

Printed Name

Printed Name

Title

Title

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

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.
2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after Owner terminates for cause in accordance with General Conditions Paragraph 15.02.
4. Failure on the part of the Owner to comply with the notice requirement in General Conditions Paragraph 15.02 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.
5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take the following action:
 - 5.1 Waive its right to perform and complete, to arrange for completion, or to obtain a new contractor, and with reasonable promptness under the circumstances:
 - 5.1.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
 - 5.1.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.
6. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:
 - 6.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
 - 6.2 additional legal, design professional, and delay costs resulting from the Contractor's Default; and
 - 6.3 liquidated damages caused by delayed performance or non-performance of the Contractor.
7. The Surety's liability is limited to the amount of this Bond.
8. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
9. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
10. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.
11. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.
12. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
13. Definitions
 - 13.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.
 - 13.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.
 - 13.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.
 - 13.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 13.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

This document was prepared in part from material (EJCDC C-610 Performance Bond) which is copyrighted as indicated below:

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1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

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

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

Associated General Contractors of America
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308
(703) 548-3118
www.agc.org

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CONTRACTOR (name and address):

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

OWNER (name and address):

City of LaGrange
200 Ridley Avenue
LaGrange, Georgia 30240

CONSTRUCTION CONTRACT

Effective Date of the Agreement: _____

Amount:

Description (name and location): Granger Park Stormwater Improvements

BOND

Bond Number:

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

Amount:

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

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (seal)

Surety's Name and Corporate Seal (seal)

By: _____
Signature

By: _____
Signature (attach power of attorney)

Printed Name

Printed Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Printed Name

Printed Name

Title

Title

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

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
 - 5.1 Claimants who do not have a direct contract with the Contractor,
 - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
 - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
 - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
 - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
 - 7.2 Pay or arrange for payment of any undisputed amounts.
 - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.
16. **Definitions**
 - 16.1 **Claim:** A written statement by the Claimant including at a minimum:
 1. The name of the Claimant;
 2. The name of the person for whom the labor was done, or materials or equipment furnished;
 3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
 4. A brief description of the labor, materials, or equipment furnished;
 5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
 6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
 7. The total amount of previous payments received by the Claimant; and
 - 16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.
 - 16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
 - 16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.
 - 16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

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**STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT**

Prepared by

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STANDARD GENERAL CONDITIONS OF THE
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TABLE OF CONTENTS

	Page
Article 1 – Definitions and Terminology	1
1.01 Defined Terms	1
1.02 Terminology	5
Article 2 – Preliminary Matters	6
2.01 Delivery of Bonds and Evidence of Insurance	6
2.02 Copies of Documents	7
2.03 Commencement of Contract Times; Notice to Proceed	7
2.04 Starting the Work	7
2.05 Before Starting Construction	7
2.06 Preconstruction Conference; Designation of Authorized Representatives	7
2.07 Initial Acceptance of Schedules	8
Article 3 – Contract Documents; Intent, Amending, Reuse	8
3.01 Intent	8
3.02 Reference Standards	9
3.03 Reporting and Resolving Discrepancies	9
3.04 Amending and Supplementing Contract Documents	11
3.05 Reuse of Documents	11
3.06 Electronic Data	11
<u>3.07 Contract Times</u>	12
Article 4 – Availability of Lands; Subsurface and Physical Conditions; Hazardous Environmental Conditions; Reference Points	12
4.01 Availability of Lands	12
4.02 Subsurface and Physical Conditions	13
4.03 Differing Subsurface of Physical Conditions	13
4.04 Underground Facilities	14
4.05 Reference Points	16
4.06 Hazardous Environmental Condition at Site	16
Article 5 – Bonds and Insurance	18
5.01 Performance, Payment, and Other Bonds	18
5.02 Licensed Sureties and Insurers	19
5.03 Certificates of Insurance	19
5.04 Contractor’s Insurance	20
5.05 Owner’s Liability Insurance	21
5.06 Property Insurance	21
5.07 Waiver of Rights	22
5.08 Receipt and Application of Insurance Proceeds	23
5.09 Acceptance of Bonds and Insurance; Option to Replace	24
5.10 Partial Utilization, Acknowledgment of Property Insurer	24

Article 6 – Contractor’s Responsibilities.....	24
6.01 Supervision and Superintendence.....	24
6.02 Labor; Working Hours.....	25
6.03 Services, Materials, and Equipment.....	26
6.04 Progress Schedule.....	27
6.05 Substitutes and “Or-Equals”.....	28
6.06 Concerning Subcontractors, Suppliers, and Others.....	30
6.07 Patent Fees and Royalties.....	32
6.08 Permits.....	32
6.09 Laws and Regulations.....	33
6.10 Taxes.....	33
6.11 Use of Site and Other Areas.....	34
6.12 Record Documents.....	34
6.13 Safety and Protection.....	35
6.14 Safety Representative.....	36
6.15 Hazard Communication Programs.....	36
6.16 Emergencies.....	37
6.17 Shop Drawings and Samples.....	37
6.18 Continuing the Work.....	39
6.19 Contractor’s General Warranty and Guarantee.....	39
6.20 Indemnification <u>and Liability</u>	40
6.21 Delegation of Professional Design Services.....	41
<u>6.22 Project Coordination Meetings</u>	42
Article 7 – Other Work at the Site.....	42
7.01 Related Work at Site.....	42
7.02 Coordination.....	42
7.03 Legal Relationships.....	43
<u>7.04 Claims Between Contractors</u>	43
Article 8 – Owner’s Responsibilities.....	44
8.01 Communications to contractor.....	44
8.02 Replacement of Engineer.....	44
8.03 Furnish Data.....	44
8.04 Pay When Due.....	44
8.05 Lands and Easements; Reports and Tests.....	44
8.06 Insurance.....	44
8.07 Change Orders.....	44
8.08 Inspections, Tests, and Approvals.....	44
8.09 Limitations on Owner’s Responsibilities.....	44
8.10 Undisclosed Hazardous Environmental Condition.....	45
8.11 Evidence of Financial Arrangements.....	45
8.12 Compliance with Safety Program.....	45
<u>8.12 Testing of Materials and Equipment</u>	45
Article 9 – Engineer’s Status During Construction.....	45
9.01 Owner’s Representative.....	45
9.02 Visits to Site.....	45
9.03 Project Representative.....	46
9.04 Authorized Variations in Work.....	46

9.05 Rejecting Defective Work	46
9.06 Shop Drawings, Change Orders and Payments.....	46
9.07 Determinations for Unit Price Work	46
9.08 Decisions on Requirements of Contract Documents and Acceptability of Work	47
9.09 Limitations on Engineer’s Authority and Responsibilities.....	47
9.10 Compliance with Safety Program	48
Article 10 – Changes in the Work; Claims	48
10.01 Authorized Changes in the Work.....	48
10.02 Unauthorized Changes in the Work.....	49
10.03 Execution of Change Orders	49
10.04 Notification to Surety.....	50
10.05 Claims and Disputes.....	50
Article 11 – Cost of the Work; Allowances; Unit Price Work.....	51
11.01 Cost of the Work.....	51
11.02 Allowances.....	54
11.03 Unit Price Work.....	55
Article 12 – Change of Contract Price; Change of Contract Times	55
12.01 Change of Contract Price	55
12.02 Change of Contract Times.....	56
12.03 Delays.....	57
Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work.....	57
13.01 Notice of Defects	57
13.02 Access to Work.....	58
13.03 Tests and Inspections.....	58
13.04 Uncovering Work	59
13.05 Owner May Stop the Work	59
13.06 Correction or Removal of Defective Work	60
13.07 Correction Period.....	60
13.08 Acceptance of Defective Work.....	61
13.09 Owner May Correct Defective Work	61
Article 14 – Payments to Contractor and Completion.....	62
14.01 Schedule of Values.....	62
14.02 Progress Payments	62
14.03 Contractor’s Warranty of Title.....	65
14.04 Substantial Completion.....	66
14.05 Partial Utilization	67
14.06 Final Inspection.....	68
14.07 Final Payment.....	68
14.08 Final Completion Delayed.....	69
14.09 Waiver of Claims.....	69
Article 15 – Suspension of Work and Termination.....	70
15.01 Owner May Suspend Work.....	70
15.02 Owner May Terminate for Cause.....	70
15.03 Owner May Terminate For Convenience.....	71

15.04 Contractor May Stop Work or Terminate	72
Article 16 – Dispute Resolution.....	72
16.01 Methods and Procedures	72
Article 17 – Miscellaneous	73
17.01 Giving Notice	73
17.02 Computation of Times.....	73
17.03 Cumulative Remedies	74
17.04 Survival of Obligations	74
17.05 Controlling Law	74
17.06 Headings	74
<u>17.07 Addresses</u>	74
<u>17.08 Forms and Record</u>	74
<u>17.09 Assignment</u>	75
<u>17.10 Inspection by Public Agencies</u>	75

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.
- 16.1 Designer - The individual or entity named as such in the Agreement, if a different person or entity from Engineer.
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. The term Drawings shall be considered synonymous with the term Plans.
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. Liquidated damages are not a penalty, but constitute liquidated damages for loss to the Owner because of increases in expenses for administration, legal counsel, accounting, engineering, construction supervision, inspection, and any other expenses incurred directly as a result of the delay of the Contractor in completing the work. This provision for liquidated damages shall be effective between the parties ipso facto without necessity for demand or putting in default by any notice or other means than by the terms of these Contract Documents, the Contractor hereby waiving any such other notice of default and acknowledging that the Contractor shall be deemed to be in default by the mere act of his failure to complete the work within the Contract Time, or within any valid extension of such time hereunder.
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. The Owner may designate an authorized representative to exercise the authority, in whole or in part, identified in these contract Documents, with such designation being identified in the Supplementary Conditions.
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~~ its 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, brochures, schedules, specified design related submittals, 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 that will be fabricated or installed. Shop drawings may also mean detail drawings, working drawings, construction drawings, and engineering data.
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.
- 44.1 Submittals – All administrative documents, Shop Drawings, Samples, product data, manufacturer's literature, quality control documents, design related documents, record documents, contract close-out documents, and/or any other specified document prepared or assembled by or for Contractor and submitted by Contractor to the Owner and/or Engineer.
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, materials, tools, equipment, incidentals, 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” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

2. 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.

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 Owner ~~either~~, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which Owner ~~either of them~~ or any additional insured may reasonably request) which Contractor ~~is and~~ Owner ~~respectively~~ are required to purchase and maintain in accordance with Article 5.

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.

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.~~

2.04 Starting the Work

- A. Contractor ~~shall~~ may 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. *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 in a format acceptable to the Engineer and in accordance with the requirements specified in the General Requirements. ~~which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.~~

2.06 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~~ Not more than ten days after the preconstruction conference, a conference attended by Contractor, 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 General Requirements. ~~provides a reasonable allocation of the Contract Price to component parts of the Work.~~

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. 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.
- E. "Imperative" or "Command" type language is used in the Contract Documents. This command language refers to and is directed to the Contractor.
- F. Emphasis, such as italics, underlining, bold text or quotes, may have been used throughout the Contract Documents. Use of emphasis shall not change the meaning of the term emphasized.

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. All sections of governing standard specifications relating to measurement and payment shall not apply to the work specified herein.

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 or reasonably should have known 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, with latest Change Order taking precedent over preceding 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
 1. Schedules on Drawings
 2. Notes on Drawings

3. Details on Drawings

4. Large Scale Drawings

5. Small Scale Drawings

6. Dimensions given as Figures

7. Scaled Dimensions

I. Bidding Requirements

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; or
 - ~~2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or~~
 - 23. 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.

3.07 Contract Times

- A. All Contract Times and time limits stated in the Contract Documents are of the essence of the Agreement.
- B. The Contractor shall proceed with the Work at a rate of progress which will ensure completion within the Contract Times.
- C. 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 time, taking into consideration the average climatic and economic conditions, and other factors prevailing in the locality of the Work.
- D. If the Contractor shall fail to perform the Work required within the Contract Times, or extended Contract Times if authorized by Change Order, then the Contractor shall pay to the Owner the full amount of liquidated damages specified in the Contract Documents for each calendar day that the Contractor shall be in default after the Contract Times stipulated in the Contract Documents.

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.

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.

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~~ may 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 or should have known 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 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 Field Order, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment ~~shall~~may 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.

D. 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.

E. 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. 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. Contractor shall furnish personnel to assist Engineer in checking lines and grades.
- 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 post, 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 that the Project is located 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.

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 regarding said condition. ~~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*

- 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 the agency having jurisdiction over sureties and insurance companies for the state in which the Project is located.
 2. Surety and Insurers must have an A.M. Best Financial Strength Rating of A or higher, with a Financial Size Category of X or higher.
 3. The surety shall have an underwriting limitation in Circular 570 in excess of the Contract Amount.
 4. No surety will be accepted who is now in default or delinquent on any bond.

5.03 *Certificates of Insurance*

- 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. ~~Deleted. 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.~~
- 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

- 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.

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*

- A. Unless otherwise provided in the Supplementary Conditions, ~~Owner~~Contractor shall purchase and maintain property insurance 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 Paragraphs 5.04 and 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 its not complying with the Contract Documents, the objecting party shall so Owner will notify the other party Contractor in writing thereof within 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 chooses 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. Any method of work suggested by the Owner or Engineer, but not specified, shall be used at the risk and responsibility of the Contractor; and the Owner and Engineer will assume no responsibility therefore. 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 Time, 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*

- 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 regular scheduled work times, e.g., four 10-hour days, five 8-hour days, or five 10-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. Night work will not be established as a regular procedure, excluding emergencies, except with written permission. Such permission, if granted, shall be upon such terms and conditions deemed appropriate in the Engineer's sole discretion.
- D. Contractor shall pay all extra costs incurred by the Owner associated with work, outside of normal 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 40 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.
- G. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operations to work which will not be affected adversely thereby. No portion of the work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.

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, and if not specified,~~ shall be of good quality, and new and unused, except as otherwise provided in the Contract Documents and shall be installed in an undamaged condition. All products provided on this Project 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 ~~Specifications~~ Contract 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.
- E. Wherever a stock size of manufactured item or piece of equipment is specified by its nominal size, it shall be the responsibility of the Contractor to determine the actual space requirements for setting and for entrance to the setting space and to make all necessary allowances and adjustments therefor in his work without additional cost to the Owner.
- F. Equipment and Construction Plant. All equipment and construction plant shall be suitable to produce the quality of work and materials required for the satisfactory completion of the work within the Contract Time and shall be satisfactory to the Engineer. The Contractor shall provide adequate and suitable equipment and construction plant to meet the requirements of the work as specified in these Contract Documents. The Contractor shall remove unsuitable equipment from the site of the work when ordered to do so by the Engineer. The Contractor shall obtain

written permission from the Owner prior to constructing temporary buildings or other structures on land owned or leased by the Owner. If permission is granted, said buildings or other structures shall comply with all applicable regulations regarding their construction and maintenance and shall be satisfactory to the Owner.

6.04 *Progress Schedule*

- A. 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 with weather conditions, as defined in the General Requirements, shall be included on the critical path of Project Schedule.
- B. The Contractor shall implement the detailed schedule of activities to the fullest extent possible between Project Coordination Meetings.
- C. 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.
- D. 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 amount.

E. The Contractor shall maintain a current copy of all construction schedules on prominent display in the Contractor's field office at the Project site.

F. 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.

G. 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 available to the Contractor and the Owner.

6.05 *Substitutes and "Or-Equals"*

~~A. See General Requirements. 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*

- 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.
- 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. Such arrangement shall not operate to make the Engineer or the Owner an arbitrator to establish subcontract limits between Contractor and Subcontractor.
- 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.

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*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction, ~~permits and licenses~~ temporary permits and licenses, necessary and incidental to the due and lawful prosecution of the work, including all permits on any part of the Work as required by law in connection with the Work. Owner ~~shall~~ will assist Contractor, when required by the permitting agency ~~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, or both. 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. It is understood and agreed that the Contractor shall be familiar with and shall observe and comply with, all Federal, State, County, and local laws, codes, ordinances, regulations, orders, and decrees, including air and water pollution and noise abatement regulations, existing, or enacted subsequent to the execution of the Contract, that in any manner affect those engaged or employed in the work, or the materials or equipment used in the work, or which in any way affect the conduct of the work. The Contractor shall strictly observe all applicable laws and regulations as to public safety, health and sanitation. No pleas of misunderstanding or ignorance on the part of the Contractor will in any way serve to modify or mitigate the provisions of these Contract Documents. The Contractor and his Surety shall indemnify and save harmless the Owner and the Engineer and all their officers, agents, and servants against any claim or liability arising from, or based on the violation of, any such law, code, ordinance, regulation, order or decree, whether by himself, his agents or his employees.
- 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 in which the Project is located 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 Record Documents as specified in the General Requirements ~~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.

6.13 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. 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.

H. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

I. The Contractor shall give due notice to any controlling person, department, or public service company, prior to adjusting items to grade and shall be held strictly liable to the Owner if any such items are disturbed, damaged or covered up during the course of the work.

J. Fire hydrants on or adjacent to the work shall be kept accessible to the fire-fighting apparatus at all times, and no material or obstruction shall be placed within 10 feet of any hydrant. Adjacent premises must be given access, as far as practicable, and obstruction of sewer inlets, gutters and ditches will not be permitted.

K. Public Safety and Convenience

1. The Contractor shall conduct his operations in a manner that will offer the least possible obstruction and inconvenience to the public and he shall not have under construction an amount of work greater than he can prosecute properly with due regard to the rights of the public.

2. Construction operations shall be conducted in a manner that will cause as little inconvenience as possible to abutting property owners. Convenient access to driveways, houses, buildings or other facilities in the vicinity of the work shall be maintained and temporary access facilities for public roadways shall be provided and maintained in satisfactory condition.

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.

B. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards, including sufficient lights and danger signals on or near the work; it shall erect suitable railings, barricades, covers, or other protective devices about unfinished work, open trenches, holes, embankments or other hazards and obstructions; where hazards to workmen or the public exist. The Contractor shall provide, at all times, all necessary watchmen on the project, for the safety of employees, delivery personnel, and the

general public, and to diligently guard and protect all work and materials, including Owner-furnished equipment. Construction equipment shall be suitably night-marked and lighted as necessary for safety considerations.

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~~ and Other Submittals*

- A. Contractor shall submit ~~Shop Drawings and Samples~~ Submittals 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~~ shall be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings ~~will~~ shall 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~~ any Submittal 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~~ Field Order 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.
4. Review by the Owner or Engineer of any plan or method of work proposed by the Contractor shall not relieve the Contractor of any responsibility therefor, and such review shall not be considered as an assumption of any risk or liability by the Owner or Engineer, or any officer, agent, or employee thereof. The Contractor shall have no claim on account of the failure or inefficiency of any plan or method so reviewed.

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 s~~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 and Liability

- A. It is understood and agreed that the Contractor shall be deemed and considered an independent contractor in respect to the work covered by these Contract Documents, and shall assume all risks and responsibility for casualties of every description in connection with the work, except that he shall not be held liable or responsible for delays or damage to work caused by acts of God, acts of public enemy, quarantine restrictions, general strikes throughout the trade, or freight embargoes not caused or participated in by the Contractor. The Contractor shall have charge and control of the entire work until completion and final acceptance of the work by the Owner. 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 .
- 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.

E. Defense of Suits: In case any action in court is brought against the Owner or the Engineer, or any officer, agent or employee of any of them, for the failure, omission, or neglect of the Contractor to perform any of the covenants, acts, matters, or things by this contract undertaken; or for injury or damage caused by the alleged negligence of the Contractor or his subcontractors or his or their agents, or in connection with any claim based on lawful demands of subcontractors, workmen, material-men, or suppliers, the Contractor shall indemnify, defend and save harmless the Owner and the Engineer and their officers, agents and employees, from all losses, damages, costs, expenses (including attorneys' fees), judgments, or decrees arising out of such action.

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.

6.22 Project Coordination Meetings

- A. 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.

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 or both 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.

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, Engineer, and/or Designer 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 shall not have any 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*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work, but will not be on-site at all hours the Work is in progress. 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 therefore 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 initial 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 Time (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 and disputes, 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~~ 10 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 ~~60-20~~ 20 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 Penton Media, 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 method under Paragraph 12.01.B.2. is 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~~may 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~~may be entitled to an equitable adjustment in Contract Times, but not Contract Price, 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.
- F. If the Progress Schedule reflects a completion date or milestone date prior to the completion date or milestone date established by the Contract Documents, this shall afford no basis to claim for delay should Contractor not complete the Work prior to the projected completion date. Should a change order be executed with a revised completion date or milestone date, the Progress Schedule shall be revised to reflect the new completion date or milestone date.

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 Time 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, as provided in Paragraph 13.05 above, the Owner 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, and all to the satisfaction of the Owner:

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~~shall 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~~shall 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*

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 five copies of 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. Retainage:
 - a. _____ The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

- b. No form of collateral in lieu of cash will be acceptable as retainage.
- c. Amounts retained by the Contractor from payments due to suppliers and subcontractors (expressed as a percentage) shall not exceed that being retained by the Owner.

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~~ Thirty 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; if any.
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) Witnessing retesting of corrected or replaced defective Work;
 - (2) Return visits to manufacturing facilities to witness factory testing or retesting;
 - (3) Submittal reviews in excess of three reviews by Engineer for substantially the same Submittal;
 - (4) Evaluation of proposed substitutes and in making changes to Contract Documents occasioned thereby;
 - (5) 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;
 - (6) 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 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.

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, retainage notwithstanding, 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.

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. 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~~ direct Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ~~ready for~~ sufficiently progressed towards 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 described in Paragraph 14.05.A.1 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, if requested by the Engineer;
 - c. a list of all Claims against Owner that Contractor believes are unsettled;
 - d. an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work have been paid or otherwise satisfied;
 - e. the final Change Order signed by the Contractor to close the Contract; and
 - f. 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, if requested by the Engineer.
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 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~~ may 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.~~

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 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.
- C. Except as allowed in Paragraph A above, the Contractor shall not suspend the work and shall not remove any equipment, tools, supplies, materials, or other items without the written permission of the Owner.

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 notify the Owner in accordance with Paragraph 10.05 of the belief that a field order, 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.

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, sell, transfer or otherwise dispose of 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.

17.10 Inspection by Public Agencies

A. Authorized representatives of the federal, state, local and other governmental agencies having jurisdiction over the work or any part thereof shall have access to the work and any records relevant to the prosecution and progress of the work. The Contractor shall provide proper facilities for such access and inspection.

END OF SECTION

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition, with Barge Modifications 08/06/2020). 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-4.02 *Subsurface and Physical Conditions*

SC-4.02 Add the following new paragraphs immediately after Paragraph 4.02.B:

- C. No reports of explorations and tests of subsurface conditions at or contiguous to the Site.
- D. Not Used.

SC-4.06 *Hazardous Environmental Conditions*

SC-4.06 Delete Paragraphs 4.06.A and 4.06.B in their entirety and insert the following:

- A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.
- B. Not Used.

SC-5.04 *Contractor's Insurance*

SC-5.04.B.1, There are no other additional insureds other than the Owner and Engineer.

SC-5.06 *Property Insurance*

SC-5.06, Delete Paragraph A and all its sub-paragraphs in their entirety and replace with the following,

- A. Installation Floater Insurance
 - 1. Contractor shall provide Installation Floater Insurance that shall protect the Contractor, the Owner, and the Engineer from all insurable risks of physical loss or damage to materials, products and equipment, while in warehouses or storage areas, during installation, during testing, and after the work is completed. It shall be of the "all risks" type, with coverages designed for the

Supplementary Conditions

circumstances which may occur in the particular work under these Contract Documents.

2. The coverage shall be for an amount not less than the full amount of the contract plus the aggregate value of the Owner-furnished products, products and materials to be erected or installed by the Contractor.
3. Installation floater insurance shall provide for losses, to be payable to the Contractor and the Owner as their interests may appear and shall contain a waiver of subrogation rights against the insured parties.
4. Certificates of insurance covering installation floater insurance shall quote the insuring agreement and all exclusions as they appear in the policy; or in lieu of certificates, copies of the complete policy may be submitted.

SC-6.02 *Labor; Working Hours*

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

1. The rates which will apply for the overtime work on behalf of the Owner: in the range of \$30.00/hour, depending on actual Resident Project Representative assigned to the Project.

SC-6.08 *Permits*

SC-6.08 Add the following subparagraphs 6.08.B.1:

1. The Owner will provide the following Permits:
 - a. Land Disturbance Permit
 - b. Not Used

SC-6.13 *Safety and Protection*

SC-6.13 The Owner does not have a safety program applicable to the Work.

SC-14.02 *Progress Payments*

SC-14.02.D.4.e After paragraph 14.02.D. 4.d, add the following:

5. The following rates will for the additional services performed by the Engineer on behalf of the Owner:

<u>Labor Grade</u>	<u>Rate</u>
Principal Engineer	\$200 to \$275
Engineer or other Licensed Professional	\$125 to \$200
Non-Licensed Individual	\$75 to \$125

SC-17.12 Contractor's Employee Verification Form

SC-17.12, following Paragraph 17.11, add the following,

17.12 Contractor's Employee Verification Form

- A. The Contractor shall complete a verification form, as included in Appendix B, for each individual who is planned to perform work on-site, including all its subcontractors. Such forms shall be submitted prior to the individual entering the Site.

END OF SECTION

Part 1 General

1.1 Description

- A. The Project consists of de-watering and re-grading Granger Park Stormwater Pond (removing approximately 13,000 cubic yards of soil), modifications to the outlet control structure, removing and replacing a failing 85-inch x 64-inch corrugated metal pipe with a 7'x5' concrete box culvert (approximately 900 LF) with associated structures, minor sanitary sewer improvements, concrete replacement, and all other related items.
- B. All work described above shall be performed as shown on the Drawings and as specified.

1.2 Project Location

The equipment and materials to be furnished will be installed at the locations shown on the Drawings.

1.3 Contractor Use of Site and Premises

- A. See Section 01 35 00.

1.4 Quantities

- A. The Owner reserves the right to alter the quantities of work to be performed or to extend or shorten the improvements at any time when and as found necessary, and the Contractor shall perform the work as altered, increased or decreased. Payment for such increased or decreased quantity will be made in accordance with the Instructions to Bidders. No allowance will be made for any change in anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract and Bond.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Partial Occupancy By Owner

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

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

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

1.2 Descriptions

- A. Measurement of an item of work will be by the unit indicated in the Bid.
- B. Final payment quantities shall be determined from the record drawings. The record drawing lengths, dimensions, quantities, etc. shall be determined by a survey after the completion of all required work. Said survey shall conform to [Section 01 78 39] of these Specifications. The precision of final payment quantities shall match the precision shown for that item in the Bid.
- C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid.
- D. Unless otherwise stated in individual sections of the Specifications or in the Bid, no separate payment will be made for any item of work, materials, parts, equipment, supplies or related items required to perform and complete the work. The costs for all such items required shall be included in the price bid for item of which it is a part.
- E. Payment will be made by extending unit prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all plant, labor, equipment, tools and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project complete in place as specified and as indicated on the Drawings.
- F. "Products" shall mean materials or equipment permanently incorporated into the work.

1.3 Clearing and Grubbing

- A. No separate payment shall be made for clearing and grubbing.

- B. The cost of moving and reestablishing landscape features, including labor and materials, shall be included in the unit price bid for the item to which it pertains.

1.4 Erosion and Sedimentation Control

A. General

1. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls, except as noted below. All other temporary and/or permanent erosion and sedimentation control costs shall be included in the unit price bid for the item to which it pertains.
 2. No payment will be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.
 3. Quantities for payment shall be based upon actual quantity constructed and authorized by the Engineer.
- B. Construction Exits: All costs for construction exits, including installation, maintenance, repair, and removal, shall be included in the unit price bid for Construction Exits.
 - C. Hay Bales: All costs for hay bales, including installation, maintenance, repair, replacement, and removal, shall be included in the unit price bid for Hay Bales.
 - D. Non-Reinforced Silt Fence: All costs for silt fence, including installation, maintenance, repair, replacement, and removal shall be included in the unit price bid for Non-Reinforced Silt Fence.
 - E. Reinforced Silt Fence: All costs for silt fence, including installation, maintenance, repair, replacement, and removal shall be included in the unit price bid for Reinforced Silt Fence. Stream buffer signs shall be included in the unit price bid for Reinforced Silt Fence.
 - F. Inlet Protection: All costs for inlet protection, including installation, maintenance, repair, and removal shall be included in the unit price for Inlet Protection.
 - G. Tree Protection: All costs for tree protection, including installation, maintenance, repair, and removal shall be included in the unit price for Tree Protection.
 - H. Storm Drain Outlet Protection: All costs for storm drain outlet protection, including installation, maintenance, repair, and removal shall be included in the unit price for Storm Drain Outlet Protection.
 - I. Stand Pipe Assembly: All costs for constructing and maintaining the stand pipe assembly shall be included in the unit price bid for stand pipe assembly.
 - J. Filter Ring: All costs for constructing and maintaining the filter ring shall be included in the unit price bid for filter ring.
 - K. Matting Blanket: All costs for constructing and maintaining the matting blanket shall be included in the unit price bid for matting blanket.

- L. Temporary Grassing: seed and mulch, where ordered by the Engineer, shall be provided at the unit price bid for Seed and Mulch.
- M. Permanent Grassing: sodding and seed and mulch, where ordered by the Engineer, shall be provided at the unit price bid for Seed and Mulch.

1.5 Box Culverts, Sewers, Outlet Structure and Accessories

A. Existing Utilities and Obstructions

1. Horizontal Conflict: Payments for conflicts with existing utilities shall be made only where additional manholes and/or additional lengths of pipe or box culvert are approved by the Engineer. Said payment shall be made at the unit prices in the Bid. No other payment will be made for any delay or extra cost encountered by the Contractor due to protection, avoidance or relocation of existing utilities, mains or services or changing the horizontal alignment of the sewer.
2. Vertical Conflict: Where authorized by the Engineer, payment for additional depth of cut required to avoid vertical conflicts shall be made at the unit prices bid for gravity sewer or box culvert. No payment will be made for relocation of existing utilities.

B. Location and Grade

1. No separate payment shall be made for survey work performed by or for the Contractor in the establishment of reference points, bench marks, cut sheets, limits of right-of-way or easement, including their restoration, as well as centerline or baseline points.
2. The "Construction Verification Surveying" cash allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks or verifying that the work has been performed accurately.

C. Construction Along Highways, Streets and Roadways: No separate payment shall be made for traffic control or maintaining highways, streets, roadways and driveways.

D. Laying and Jointing

1. Measurement for payment at the unit price bid for sewers and box culverts shall be made from centerline of manhole to centerline of manhole or to inside face of structure wall penetrated. Depth of cut shall be the vertical distance measured from invert to ground level at centerline. Cut sheets prepared by the Contractor and approved by the Engineer shall be the basis for payment. Payment for twin culvert shall include both culverts.
2. No additional payment will be made for replacement of defective materials.

Unit Price Measurement and Payment

3. No additional payment will be made for maintaining flow while placing the new sewer in service.
 4. No separate payment shall be made for detection tape.
 5. No additional payment will be made for removing existing sewers and manholes in order to install new sewer.
- E. Manholes
1. All costs for constructing the manhole bases, shall include but not be limited to removing existing manholes, when applicable, the precast concrete base, the transition slab for bases larger than four foot diameter, rubber boots, inverts, and connecting the pipes to the manhole, shall be included in the unit price bid for the appropriate size precast concrete manhole Base.
 2. Measurement for payment at the unit price for precast concrete manhole risers shall be made from the top of the manhole frame and cover to:
 - a. The top inside lip of the manhole base for 4-Foot Diameter Bases.
 - b. The top inside lip of the transition slab for larger bases.
 - c. The top of the box culvert, when installed thereon.
 3. Payment for precast concrete manhole over existing sewer shall include all costs for the concrete slab, concrete base, connecting pipes to manhole, constructing invert, and plugging existing downstream pipe.
 4. Manhole frames and covers shall be paid for separately.
- F. Existing reconnections: All costs for existing reconnections shall be included in the unit price bid for the item to which they pertain.
- G. GDOT Standard 2535P Standard Precast Ends: All costs related to the construction and installation of headwalls shall be included in the unit price bid for the item to which it pertains.
- H. Outlet Structure Modification: All costs related to the modification to the existing outlet control structure shall be included in the unit price bid for the item to which it pertains. Including but not limited to coring new orifice holes with valves, 24-inch drain valve operation, etc.
- I. Remove and Dispose Existing Pipe: All costs related to the removal and disposal of the existing pipe shall be included in the unit price bid for the item to which it pertains.
- J. Clean-up and Testing
1. Payment for clean-up and testing shall be made at the unit price bid for clean-up and testing. Any other cost for labor, material, and equipment required shall be included in the unit price bid for the item to which it pertains.

2. No payment for clean-up and testing shall be made for any length of line unless both testing and clean-up have been successfully completed for that segment of line for which payment is being requested.

1.6 Hardscapes

- A. Remove and Dispose Existing Concrete Sidewalk: All costs related to the removal and disposal of the existing concrete sidewalk shall be included in the unit price bid for the item to which it pertains.
- B. Concrete sidewalk: All costs related to the construction of the concrete sidewalk shall be included in the unit price bid for the item to which it pertains.
- C. Remove and Dispose Wood Fence: All costs related to the removal and disposal of the existing wood fence shall be included in the unit price bid for the item to which it pertains.
- D. Replace wood fence: All costs related to the construction of the wood fence shall be included in the unit price bid for the item to which it pertains.
- E. Chain link fence: All costs related to the removal and replacement of the existing chain link fence shall be included in the unit price bid for the item to which it pertains.
- F. Gravel Parking Area: All costs related to restoration of gravel parking area shall be included in the unit price bid for the item to which it pertains.

1.7 Earthwork

- A. Earth Excavation
 1. No separate payment will be made for earth excavation. The cost of such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.
 2. No separate payment will be made for providing sheeting, bracing and timbering.
- B. Rock Excavation
 1. Rock excavation will be paid for separately at the unit price bid.
 2. Payment will be made for measured quantity of rock excavated, at the unit price bid per cubic yard. The unit price for rock excavation shall include the cost of rock excavation, the cost of disposing of rock, the cost of providing sufficient and suitable fill material and all costs incidental thereto. The allowable volume of rock excavation for payment, unless otherwise authorized by the Engineer, shall be based on the measurements described below. No allowance shall be made for excavation beyond the required dimensions.
 3. Horizontal measurement shall be to the actual dimension of the excavation, but not exceeding one foot beyond the outer surface of the structure or a minimum of two feet from a wall.

Unit Price Measurement and Payment

4. Depth measurement shall be made from the original top of rock to the bottom of the structure or ditch as specified, or to the bottom of the rock, whichever has the higher elevation.
 5. The Engineer must be given reasonable notice to measure all rock.
- C. Foundation Excavation
1. Costs for undercutting, foundation preparation, and removal and replacement of unsuitable material, where shown on the Drawings or specified, shall be included in the appropriate lump sum bid.
 2. Payment for removal and replacement of unsuitable material which is ordered by the Engineer which is not shown on the Drawings or specified, shall be made at the unit price bid for:
 - a. Removal of Unsuitable Backfill Material and Replacement with Crushed Stone
 - b. Removal of Unsuitable Backfill Material and Replacement with Earth Material
 3. No separate payment will be made for concrete backfill of trenches beneath structures. The cost of this work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.
 4. Additional costs of corrective work, made necessary by unauthorized excavation of earth or rock, shall be borne by the Contractor.
- D. Dewatering: No separate payment will be made for dewatering required to accomplish the work.
- E. Backfilling: No separate payment will be made for backfilling or excavation, hauling and placement of borrow material. The cost of all such work and all costs incidental thereto shall be included in the unit price bid for the item to which the work pertains.
- F. Pond Grading: All costs related to pond grading/mucking out shall be included in the unit price bid for the item to which it pertains. Including but not limited to dewatering, mucking out, drying, hauling off, final grade.

1.8 Trench Excavation and Backfill

- A. No separate or additional payment will be made for any special or unique method, means, techniques or equipment necessary for the Contractor's compliance with these Specifications, regulatory requirements, permits, laws or regulations which govern this Project.
- B. Trench Excavation: No separate payment will be made for trench excavation. All costs shall be included in the unit price bid for the item to which it pertains at the appropriate depth.

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- C. Sheeting, Bracing and Shoring: No separate payment will be made for providing any sheeting, bracing and shoring.
- D. Rock Excavation
1. Rock excavation shall be paid for as an extra in addition to payment for pipe provided for elsewhere in these Specifications. Payment will be made for the measured quantity of rock excavated, at the unit price bid.
 2. The unit price bid for Rock Excavation shall include all costs of rock excavation, the cost of additional bedding and backfill material as specified and all costs incidental thereto.
 3. The maximum allowable volume of rock excavation for payment shall be based on a trench width equal to the outside diameter of the pipe barrel plus 18-inches but not less than 36-inches and a depth of rock on the pipe centerline, from the top of the rock to the bottom of the rock or the specified bottom of the trench, whichever has the higher elevation.
 4. The Engineer must be given reasonable notice to measure all rock.
 5. No allowance shall be made for excavating to extra widths for construction of manholes or other appurtenances, for excavating to sloping sides, or for excavations made necessary by the physical limitations of the Contractor's equipment. Cost of such additional rock excavation shall be included in the unit price bid for the item to which it pertains.
- E. Dewatering Excavations: All costs of equipment, labor and materials required for dewatering shall be included in the price bid for the item to which it pertains.
- F. Trench Foundation and Stabilization
1. No payment for trench stabilization shall be authorized until after the trench has been dewatered. If the pipe is installed in an inadequately prepared trench bottom, the Engineer shall notify the Contractor in writing of the deficiency and will not authorize payment for that portion of that length of pipe which was improperly installed.
 2. Payment for trench stabilization shall be made on the basis of the amount authorized and the unit price bid for Trench Stabilization. Payment shall include all costs for the removal and disposal of the unsuitable material and replacement with crushed stone. No additional payment will be made for material required for specified bedding.
 3. Payment for filter fabric shall be at the unit price bid for Filter Fabric under trench stabilization. Payment shall include all costs for the placement of the filter fabric.
- G. Bedding and Haunching
1. No additional payment will be made for additional trench depth.

Unit Price Measurement and Payment

2. No separate payment will be made for material used to provide specified bedding. The cost of all bedding materials shall be included in the unit price bid for the item to which it relates, except for trench stabilization.
 3. No separate or additional payment will be made for using a higher class bedding as a result of these Specifications requiring a higher class bedding due to the depth of cover over the pipe.
 4. No additional payment will be made for improved bedding required to compensate for over excavation of the trench.
- H. Initial Backfill
1. No separate payment shall be made for initial backfill.
 2. No separate payment shall be made for drying out the initial backfill material in order to meet the compaction requirements.
 3. No separate payment shall be made for the adding of moisture to the initial backfill materials in order to meet the compaction requirements.
 4. No separate payment shall be made for providing select backfill material if the in-situ material cannot meet the compaction requirements, except as may be allowed in Paragraph K of this Article of the Specifications.
- I. Concrete Encasement: All costs associated with encasing the pipe with concrete, as detailed on the Drawings, shall be included in the unit price bid for Concrete Encasement of Pipeline.
- J. Final Backfilling
1. No additional payment will be made for additional material when excavated materials are used.
 2. No separate payment shall be made for drying out the final backfill material in order to meet the compaction requirements.
 3. No separate payment shall be made for the adding of moisture to the final backfill materials in order to meet the compaction requirements.
 4. No additional payment will be made for providing select backfill material if the in-situ material cannot meet the compaction requirements, except as may be allowed in Paragraph K of this Article of the Specifications.
- K. Select Backfill
1. No payment will be made for select backfill unless authorized by the Owner.
 2. No payment shall be made for select backfill where in situ soils do not meet the moisture requirements.

3. Paragraph D of this Article of the Specifications state the methods of payment for select backfill material associated with rock excavation.
4. If authorized by the Owner, payment for removal and replacement of unsuitable backfill material will be made at the unit price bid for Removal of Unsuitable Backfill Material and Replacement With:
 - a. Crushed Stone
 - b. Suitable Earth Material
5. If authorized by the Owner, measurement for payment shall be based on a trench width equal to the outside diameter of the pipe barrel plus two feet, and a depth measured at the pipe centerline, from the top of the unsuitable material to the bottom of the unsuitable material or the specified bottom of the trench, whichever has the higher elevation. If under pavement, the measured depth shall be extend to the pavement sub grade. No payment will be made for additional excavation as a result of the Contractor's means and methods such as trench box width or sloped trenches, even if these measures are taken as a result of OSHA requirements or other reasons.

1.9 Steel Casings

- A. Payment for casing shall be made only at the completion of all work specified for the casing installation. No partial payment shall be made for the construction of the casing.
- B. Casing pipe may be included in Partial Payment Requests as stored materials, if the casing pipe is stored at the Project site. Casing pipe which has been properly installed, but has not yet been paid for as installed casing, may also be included as stored materials.
- C. In the event that rock is encountered during the installation of the pipe casing which, in the opinion of the Engineer cannot be removed through the casing then the Engineer may authorize the Contractor to complete the crossing by another method via a change order.
- D. No additional payment shall be made for rock excavation through the casing.
- E. Payment for pipe in casing shall be made only at the completion of all work specified for the pipe installation. Payment for pipe in the casing shall be made only at the one unit price bid for the appropriate crossing.

1.10 Replacing Pavement

- A. Payment for removing and replacing pavement, for asphalt pavement, concrete pavement, gravel driveways, gravel parking areas or concrete sidewalks will be made as a separate item based on the conditions set forth in Paragraphs B, C, and E below. The unit price bid shall include all costs associated with removing and replacing pavement, gravel driveways, gravel parking areas or sidewalks, including providing

select backfill if necessary, traffic control and temporary measures for maintaining traffic.

- B. Payment shall be made only for those areas which are shown on the Drawings for pavement, gravel driveways, gravel parking areas or sidewalks to be removed and replaced.
- C. Under no circumstances, including if pavement, gravel driveways, gravel parking areas or sidewalks are damaged due to collapsing soils or the Contractor's means and methods, shall additional payment be made for removing and replacing pavement, gravel driveways, gravel parking areas or sidewalks. The Contractor shall prepare the Bid accordingly if there are areas which it believes pavement, gravel driveways, gravel parking areas or sidewalk damage is not avoidable but is not indicated on the Drawings to be eligible for payment.
- D. Payment for soils testing shall be made from the "soils and concrete testing" cash allowance. No payment shall be made for tests that fail to verify required results.
- E. No additional payment will be made for removing and replacing damaged adjacent pavement, sidewalks or curb and gutter.
- F. Costs for removal and replacement of concrete drainage flumes shall be included in the unit price bid for the item in which it pertains.

1.11 Cash Allowances

- A. General
 - 1. The Contractor shall include in the Bid Total all allowances stated in the Contract Documents. These allowances shall cover the net cost of the services provided by a firm selected by the Owner. The Contractor's handling costs, labor, overhead, profit and other expenses contemplated for the original allowance shall be included in the items to which they pertain and not in allowances.
 - 2. No payment will be made for nonproductive time on the part of testing personnel due to the Contractor's failure to properly coordinate testing activities with the work schedule or the Contractor's problems with maintaining equipment in good working condition. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests.
 - 3. No payment shall be provided for services that fail to verify required results.
- B. Should the net cost be more or less than the specified amount of the allowance, the Contract will be adjusted accordingly by change order. The amount of change order will not recognize any changes in handling costs at the site, labor, overhead, profit and other expenses caused by the adjustment to the allowance.
- C. Documentation

1. Submit copies of the invoices with each periodic payment request from the firm providing the services.
2. Submit results of services provided which verify required results.

D. Schedule of Cash Allowances

1. Soils and Concrete Testing: Allow the amount provided in the Bid for the services of a geotechnical engineering firm and testing laboratory to verify soils conditions including trench excavation and backfill, and similar issues and for the testing of concrete cylinders for poured in place concrete.
2. Unforeseen Work Elements: Allow the amount provided in the Bid for unforeseen costs that may occur due to unforeseen circumstances.
3. Landscape Allowance: Allow the amount provided in the Bid for landscape replacement costs that may occur during construction.

END OF SECTION

Part 1 General

1.1 Scope

This section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

1.2 Definitions

- A. For the purposes of these Contract Documents, a “substitute item” shall be defined as one of the following:
 - 1. A product or manufacturer offered as a replacement to a specified product or manufacturer.
 - 2. A product or manufacturer offered in addition to a specified product or manufacturer.
- B. For the purposes of these Contract Documents, a “substitute construction method” shall be defined as one of the following:
 - 1. A mean, method, technique, sequence or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.
 - 2. A mean, method, technique, sequence or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.3 General

- A. An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the Drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item or construction method.
- B. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.
- C. If the manufacturer is named on the Drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.
- D. Whenever the Engineer's design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed first in the list of approved manufacturers in the Specifications. Any Bidder intending to furnish

Substitution Procedures

products of other than the first listed manufacturer, or furnish substitute items, shall:

1. Verify that the item being furnished will fit in the space allowed, perform the same functions and have the same capabilities as the item specified,
2. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product,
3. Include the cost of any architectural, structural, mechanical, piping, electrical or other modifications required, and
4. Include the cost of required additional work by the Engineer, if any, to accommodate the item.

1.4 Approvals

Approval, of a substitution as an acceptable manufacturer, of the Engineer is dependent on determination that the product offered is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life and other criteria to that on which the design is based; and will require no major modifications to structures, electrical systems, control systems or piping systems.

1.5 Substitutions and Options

A. After Notice to Proceed

1. Substitute items will be considered only if the term "equal to" precedes the names of acceptable manufacturers in the Specification.
2. Where items are specified by referenced standard or specified as indicated in Article 1.03, Paragraph A above, such items shall be submitted to the Engineer for review.
3. The Contractor shall submit shop drawings on the substitute item for the Engineer's review in accordance with Section 01 33 00.
4. No substitutions will be considered for the manufacturers listed in the Bid.

B. Prior to Opening of Bids

1. No consideration or approvals will be made for products specified by a referenced standard, or specified as indicated in Article 1.03, Paragraph A, above. Such consideration may occur only after the Notice to Proceed.
2. No consideration or approvals will be made for products being offered where the term "equal to" precedes the name of an approved product. Such substitution consideration may occur only after the Notice to Proceed.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

The work under this Section includes preparation and submittal of a schedule of values.

1.2 General

- A. Timing of Submittal: Submit to the Engineer, a schedule of values allocated to the various portions of the work, within 10 days after Notice to Proceed. The first progress payment will not be made until the next pay cycle following the Engineer's approval of the Contractor's values.
- B. Supporting Data: Upon request of the Engineer, support the values with data which will substantiate their correctness.
- C. Use of Schedule: The schedule of values, unless objected to by the Engineer, shall be used only as a basis of the Contractor's Application for Payment.

1.3 Form and Content of Schedule of Values

- A. Form and Identification
 - 1. Type schedule on 8-1/2 x 11-inch white paper.
 - 2. Contractor's standard forms and automated printout may be used.
 - 3. Identify schedule with:
 - a. Title of Project and location
 - b. Engineer
 - c. Name and address of Contractor
 - d. Contract designation
 - e. Date of submission
- B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by structure, then by CSI Format, for ease of field verification of quantities completed in each structure.

C. Format

1. Follow the Table of Contents of the Contract Documents as the format for listing the component items.
2. Identify each item with the number and title of the respective major section of the Specifications.

D. For each major line item list sub-values of major products or operations under the item.

E. For the Various Portions of the Work:

1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid.
 - b. The total installed value, including Contractor's overhead and profit, less item a. above.

F. The sum of all values listed in the schedule shall equal the Bid Total.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

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

1.2 Preconstruction Conference

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

Project Meetings

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

1.3 Project Coordination Meetings

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

4. Identify problems which impede planned progress.
5. Review off-site fabrication problems.
6. Review Contractor's corrective measures and procedures to regain plan schedule.
7. Review Contractor's revision to the construction schedule as outlined in the Supplementary Conditions.
8. Review submittal schedule; expedite as required to maintain schedule.
9. Maintenance of quality and work standards.
10. Review changes proposed by Owner for their effect on the construction schedule and completion date.
11. Complete other current business.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Preparing, furnishing, distributing, and periodic updating of the construction schedules as specified herein.
- B. The purpose of the schedule is to demonstrate that the Contractor can complete the overall Project within the Contract Time and meet all required interim milestones.

1.2 Submittals

- A. Overall Project Schedule (OPS)
 - 1. Submit the schedule within 10 days after date of the Notice to Proceed.
 - 2. The Engineer will review the schedule and return it within 10 days after receipt.
 - 3. If required, resubmit within 10 days after receipt of a returned copy.
- B. Near Term Schedule (NTS)
 - 1. Submit the first Near Term Schedule within 10 days of the Notice to Proceed.
 - 2. The Engineer will review the schedule and return it within 10 days after receipt.
- C. Submit an update of the OPS and NTS with each progress payment request.
- D. Submit the number of copies required by the Contractor, plus four copies to be retained by the Engineer.

1.3 Approval

- A. Approval of the Contractor's detailed construction program and revisions thereto shall in no way relieve the Contractor of any of Contractor's duties and obligations under the Contract. Approval is limited to the format of the schedule and does not in any way indicate approval of, or concurrence with, the Contractor's means, methods and ability to carry out the work.

1.4 Overall Project Schedule (OPS)

- A. The Contractor shall submit to the Owner for approval a detailed Overall Project Schedule of the Contractor's proposed operations for the duration of the Project. The OPS shall be in the form of a Gantt/bar chart.

B. Gantt/Bar Chart Schedule

1. Each activity with a duration of five or more days shall be identified by a separate bar. Activities with a duration of more than 20 days shall be sub divided into separate activities.
2. The schedule shall include activities for shop drawing preparation and review, fabrication, delivery, and installation of major or critical path materials and equipment items.
3. The schedule shall show the proposed start and completion date for each activity. A separate listing of activity start and stop dates and working day requirements shall be provided unless the information is shown in text form on the Gantt/bar chart.
4. The schedule shall identify the Notice to Proceed date, the Contract Completion date, major milestone dates, and a critical path.
5. The schedule shall be printed on a maximum 11 x 17-inch size paper. If the OPS needs to be shown on multiple sheets, a simplified, one page, summary bar chart showing the entire Project shall be provided.
6. The schedule shall have a horizontal time scale based on calendar days and shall identify the Monday of each week.
7. The schedule shall show the precedence relationship for each activity.

1.5 Near Term Schedule (NTS)

- A. The Contractor shall develop and refine a detailed Near Term Schedule showing the day to day activities with committed completion dates which must be performed during the upcoming 30-day period. The detailed schedule shall represent the Contractor's best approach to the Work which must be accomplished to maintain progress consistent with the Overall Project Schedule.
- B. The Near Term Schedule shall be in the form of Gantt/bar chart and shall include a written narrative description of all activities to be performed and describe corrective action to be taken for items that are behind schedule.

1.6 Updating

- A. Show all changes occurring since previous submission of the updated schedule.
- B. Indicate progress of each activity and show actual completion dates.
- C. The Contractor shall be prepared to provide a narrative report at the [Project Coordination][Progress] Meetings. The report shall include the following:
 1. A description of the overall Project status and comparison to the OPS.

2. Identify activities which are behind schedule and describe corrective action to be taken.
3. A description of changes or revisions to the Project and their effect on the OPS.
4. A description of the Near Term Schedule of the activities to be completed during the next 30 days. The report shall include a description of all activities requiring participation by the Engineer and/or Owner.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction videos and photographs of the Project.
- B. Photo and video files shall become the property of the Owner and none of the videos or photographs shall be published without express permission of the Owner.

1.2 Pre and Post Construction Videos and Photographs

- A. Prior to the beginning of any work, the Contractor shall take videos and photographs of the work area to record existing conditions.
- B. Following completion of the work, another set of videos and photographs shall be made showing the same areas and features as in the pre-construction videos and photographs.
- C. All conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions.

1.3 File Format, Media and Submittals

- A. Photographs shall be in "jpg" format.
- B. Videos shall be in a format viewable by Microsoft Windows Media Player or Apple QuickTime Player. Audio narration is desirable.
- C. Files shall be named such that what is being viewed is self-evident.
- D. Files shall be submitted on a flash drive, compact disk (CD) or a digital video disk (DVD). If submitted on DVD, disk shall be recorded in "Minus R" format.
- E. The pre-construction videos and photographs shall be submitted to the Engineer within 25 calendar days after the date of receipt by the Contractor of Notice to Proceed. Post-construction videos and photographs shall be provided prior to final acceptance of the Project.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section includes submittal to the Engineer of shop drawings, product data and samples required by the various Sections of these Specifications.
- B. Submittal Contents: The submittal contents required are specified in each Section.
- C. Definitions: Submittals are categorized as follows:
 - 1. Shop Drawings
 - a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.
 - b. Provide newly-prepared information, on bond sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note dimensions that are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final "Action" markings by the Engineer.
 - c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, Specification Section, schedule or room numbers shown on the Contract Drawings.
 - d. Minimum assembly drawings sheet size shall be 11 x 17-inches.
 - e. Minimum detail sheet size shall be 8-1/2 x 11-inches.
 - f. Minimum Scale:
 - i. Assembly Drawings Sheet, Scale: 1-inch = 30 feet.
 - ii. Detail Sheet, Scale: 1/4-inch = 1 foot.

Submittal Procedures**2. Product Data**

- a. Product data includes standard printed information on materials, products and systems, not specially prepared for this Project, other than the designation of selections from among available choices printed therein.
- b. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.

3. Samples

- a. Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
- b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by the Engineer. Engineer will note "test" samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.

4. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the work but not processed as shop drawings, product data or samples.

1.2 Specific Category Requirements

- A. General: Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal. Submittals shall contain:

1. The date of submittal and the dates of any previous submittals.

2. The Project Title.
3. Numerical submittal numbers, starting with 1.0, 2.0, etc. Revisions to be numbered 1.1, 1.2, etc.
4. The Names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the Specification Section number, permanent equipment tag numbers and applicable Drawing No.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Notification to the Engineer in writing, at time of submissions, of any deviations on the submittals from requirements of the Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8 x 3-inch blank space for Contractor and Engineer stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the work and of Contract Documents.
13. Submittal sheets or Drawings showing more than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out.

1.3 Routing of Submittals

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

Part 2 Products

2.1 Shop Drawings

- A. Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.
- B. Submit all shop assembly drawings, as 11 x 17-inches, unless as required by Paragraph A, a larger sheet is required. In this case, submit 22 x 34 -inches sheets.
- C. When approved by the Engineer, electronic files may be submitted on a CD in a .pdf format or by email.
- D. Submit the number of copies which are required to be returned (not to exceed three) plus three copies which will be retained by the Engineer.

2.2 Manufacturer's Literature

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

2.3 Samples

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

2.4 Colors

- A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.
- B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

Part 3 Execution

3.1 Contractor's Coordination of Submittals

- A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:
 - 1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
 - 2. Coordinate as required with all trades and all public agencies involved.
 - 3. Submit a written statement of review and compliance with the requirements of all applicable technical Specifications as well as the requirements of this Section.
 - 4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.
- B. Each and every copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.
- C. The Owner may backcharge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a "No Exceptions Taken" mark.
- D. Grouping of Submittals
 - 1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items.
 - 2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Engineer along with Contractor's comments as to compliance, non-compliance or features requiring special attention.
- E. Schedule of Submittals
 - 1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and some time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.2 Timing of Submittals

- A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
- B. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal.

3.3 Reviewed Shop Drawings

- A. Engineer Review
 - 1. Allow a minimum of 30 days for the Engineer's initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the work, and therefore the work would be expedited if processing time could be foreshortened.
 - 2. Acceptable submittals will be marked "No Exceptions Taken". A minimum of three copies will be retained by the Engineer for Engineer's and the Owner's use and the remaining copies will be returned to the Contractor.
 - 3. Submittals requiring minor corrections before the product is acceptable will be marked "Make Corrections Noted". The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked "No Exceptions Taken" prior to installation or use of products.
 - 4. Submittals marked "Amend and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
 - 5. The "Rejected" notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.
 - 6. Only two copies of items marked "Amend and Resubmit" and "Rejected" will be reviewed and marked. One copy will be retained by the Engineer and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.
- B. No work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer's stamp.
- C. Substitutions: In the event the Contractor obtains the Engineer's approval for the use of products other than those which are listed first in the Contract Documents, the

Contractor shall, at the Contractor's own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.

- D. Use of the "No Exceptions Taken" notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.4 Resubmission Requirements

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

END OF SECTION

Part 1 General

1.1 Scope

The scope of this Section is to convey to the Contractor unique and unusual stipulations and requirements which have been established for this Project. Some of the stipulations and requirements are a result of negotiations with various entities and organizations which have an interest in this Project. Some requirements are based on technical aspects of the Project which are not otherwise conveyed to the Contractor. The provisions of this Section shall supersede the provisions of the Division 01 through 49 Specifications but shall not supersede the Bidding Requirements, Contract Forms or Conditions of the Contract.

1.2 Submittals

A. Sequence Submittal

1. Submit a proposed sequence in accordance with Section 01 33 00 – Submittal Procedures, with appropriate times of starting and completion of tasks to Engineer for review.
2. The Contractor may propose alternatives to the sequencing constraints to that shown in this Section in an attempt to reduce the disruption of the operation of the existing facility or streamline the tasks of this Contract. The Owner and Engineer are not obligated to accept any of these alternatives.

1.3 Existing Facility Operations

- A. The Contractor shall coordinate the work with the Owner so that the construction will not restrain or hinder the operation of the existing facilities. If, at any time, any portion of the facilities are out of service, the Contractor must obtain approval from the Owner as to the date, time and length of time that portion of the facilities are out of service. Any such interruption of service shall be minimized and shall not exceed the limits established under article 1.6 of this specification.
- B. Connections to the existing facilities or alteration of existing facilities will be made at times when the facility involved is not in use or at times, established by the Owner, when the use of the facility can be conveniently interrupted for the period of time needed to make the connection or alteration. Bypass pumping may be required to connect to existing facilities.
- C. After having coordinated the work with the Owner, the Contractor shall prepare a submittal in accordance with Section 01 33 00 – Submittal Procedures, to include the time, time limits and methods of each connection or alteration and have the approval of the Engineer before any work is undertaken on the connections or alterations.
- D. Before any roadway or facilities are blocked off, the Owner's approval shall be obtained to coordinate operations for the plant.

1.4 Sequencing

A. General

1. The Contractor shall be solely responsible for all construction sequencing.
2. The completion of specific preliminary sequencing tasks will be required prior to any significant site demolition.
3. The construction schedule and tasks shall be reviewed and approved by the Engineer before site demolition begins.

- B. Notify the Owner at least ten days prior to starting to relocate piping or taking existing components out of service.

1.5 Sequencing Constraints

- A. The Contractor shall be solely responsible for all construction sequencing.

1.6 Administration Period

- A. During the Administration Period the Contractor shall be limited in site access to only the following:

1. Nondestructive field verification of existing conditions.
2. Install initial erosion control measures.
3. Construction of Engineer's and Contractor's temporary field offices.

- B. During the Administration Period the Contractor shall complete, as a minimum, the following:

1. Issuance of contracts, subcontracts, and purchase orders for all major products and systems.
2. Complete all submittals, release for manufacture, and schedule delivery for the products or systems referenced above.
3. Prepare and submit approvable documents required by Section 01 32 16, including OPS and the Schedule of Values.
4. Install Engineer's and Contractor's temporary field offices complete with all required utilities, internet, network, supplies, and furnishings required.
5. Complete software delivery and training required by Section 01 31 29.
6. Complete and submit all preconstruction photos, videos.

- C. The duration of the Administration Period is 60 consecutive calendar days, after which time the Construction Period shall automatically begin. Construction Period may begin prior to the 60 days, provided all requirements of the Administration Period have been completed, submitted, and approved by the Engineer.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, including building permits, and for complying with any applicable federal, state, county and municipal laws, codes and regulations, in connection with the prosecution of the work.
- B. The Contractor shall take proper safety and health precautions to protect the work, the workers, the public and the property of others.
- C. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the work, except for any completed unit of construction thereof which may heretofore have been accepted.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Description

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.2.

1.2 Standard Organizations

A. Piping and Valves

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

B. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute

Codes and Standards

- ASTM American Society for Testing and Materials

- C. Painting and Surface Preparation
 - NACE National Association of Corrosion Engineers
 - SSPC Steel Structures Painting Council

- D. Electrical and Instrumentation
 - AEIC Association of Edison Illuminating Companies
 - AIEE American Institute of Electrical Engineers
 - EIA Electronic Industries Association
 - ICEA Insulated Cable Engineers Association
 - IEC International Electrotechnical Commission
 - IEEE Institute of Electrical and Electronic Engineers
 - IES Illuminating Engineering Society
 - IPC Institute of Printed Circuits
 - IPCEA Insulated Power Cable Engineers Association
 - ISA The Instrumentation, Systems, and Automation Society
 - NEC National Electric Code
 - NEMA National Electrical Manufacturers Association
 - NFPA National Fire Protection Association
 - REA Rural Electrification Administration
 - TIA Telecommunications Industries Association
 - UL Underwriter's Laboratories
 - VRCI Variable Resistive Components Institute

- E. Aluminum
 - AA Aluminum Association
 - AAMA American Architectural Manufacturers Association

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

- G. Welding
 - ASME American Society of Mechanical Engineers
 - AWS American Welding Society

- H. Government and Technical Organizations
 - AIA American Institute of Architects
 - APHA American Public Health Association

APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
CFR	Code of Federal Regulations
CSI	Construction Specifications Institute
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FmHA	Farmers Home Administration
FS	Federal Specifications
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

I. General Building Construction

AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AITC	American Institute of Timber Construction
APA	American Parquet Association, Inc.
APA	American Plywood Association
BHMA	Builders Hardware Manufacturers Association
BIFMA	Business and Institutional Furniture Manufacturers Association
DHI	Door and Hardware Institute
FM	Factory Mutual Fire Insurance Company
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
IME	Institute of Makers of Explosives
ISANTA	International Staple, Nail and Tool Association
ISDSI	Insulated Steel Door Systems Institute
IWS	Insect Screening Weavers Association
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAGDM	National Association of Garage Door Manufacturers
NCCLS	National Committee for Clinical Laboratory Standards
NFPA	National Fire Protection Association
NFSA	National Fertilizer Solutions Association
NKCA	National Kitchen Cabinet Association

 Codes and Standards

NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
RMA	Rubber Manufacturers Association
SBC	SBCC Standard Building Code
SDI	Steel Door Institute
SIA	Scaffold Industry Association
SMA	Screen Manufacturers Association
SPRI	Single-Ply Roofing Institute
TCA	Tile Council of America
UBC	Uniform Building Code
J. Roadways	
AREA	American Railway Engineering Association
DOT	Georgia Department of Transportation
K. Plumbing	
AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code
L. Refrigeration, Heating, and Air Conditioning	
AMCA	Air Movement and Control Association
ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
HEI	Heat Exchange Institute
IIAR	International Institute of Ammonia Refrigeration
NB	National Board of Boilers and Pressure Vessel Inspectors
PFMA	Power Fan Manufacturers Association
SAE	Society of Automotive Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMC	SBCC Standard Mechanical Code
TEMA	Tubular Exchangers Manufacturers Association
M. Equipment	
AFBMA	Anti-Friction Bearing Manufacturers Association, Inc.
AGMA	American Gear Manufacturers Association
ALI	Automotive Lift Institute
CEMA	Conveyor Equipment Manufacturers Association
CMAA	Crane Manufacturers Association of America
DEMA	Diesel Engine Manufacturers Association
MMA	Monorail Manufacturers Association
OPEI	Outdoor Power Equipment Institute, Inc.

PTI	Power Tool Institute, Inc.
RIA	Robotic Industries Association
SAMA	Scientific Apparatus Makers Association

1.3 Symbols

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

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

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

1.2 Payment for Testing Services

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

1.3 Laboratory Duties

- A. Cooperate with the Owner, Engineer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.
 - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 - 2. Ascertain compliance with requirements of the Contract Documents.

Testing Laboratory Services

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

1.4 Contractor Responsibilities

- A. Cooperate with laboratory personnel, provide access to work and/or comply with manufacturer's requirements.
- B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.

- D. Furnish required labor and facilities to:
 - 1. Provide access to work to be tested;
 - 2. Obtain and handle samples at the site;
 - 3. Facilitate inspections and tests;
 - 4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.
- E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.
- G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.5 Quality Assurance

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

1.6 Product Handling

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

1.7 Furnishing Materials

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

1.8 Code Compliance Testing

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

1.9 Contractor's Convenience Testing

- A. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 Schedules for Testing

A. Establishing Schedule

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

B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the work, all extra costs for testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner.

1.11 Taking Specimens

A. Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 Transporting Samples

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

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Temporary facilities required for this work include, but are not necessarily limited to:
 - 1. Temporary utilities such as water and electricity.
 - 2. First aid facilities.
 - 3. Sanitary facilities.
 - 4. Potable water.
 - 5. Temporary enclosures and construction facilities.

1.2 General

- A. First aid facilities, sanitary facilities and potable water shall be available on the Project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the Project warrants.
- B. Maintenance: Use all means necessary to maintain temporary facilities in proper and safe condition throughout progress of the work. In the event of loss or damage, immediately make all repairs and replacements necessary, at no additional cost to the Owner.
- C. Removal: Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

1.3 Quality Assurance

- A. Temporary Electric: Installation of all temporary electric facilities shall comply with NECA, NEMA and UL standards and regulations for such facilities. Install service to comply with NFPA 70.

1.4 Temporary Utilities

- A. General
 - 1. Provide and pay all costs for all water, electricity and other utilities required for the performance of the work.
 - 2. Pay all costs for temporary utilities until Project completion.
 - 3. Costs for temporary utilities shall include all power, water and the like necessary for testing equipment as required by the Contract Documents.

Temporary Facilities and Controls

B. Temporary Water:

1. Connect to existing facility water system. Provide reduced pressure backflow prevention.
2. Provide all necessary temporary piping. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing, as necessary.
3. Upon completion of the Work, remove all such temporary piping.
4. Provide and remove water meters, as required by governing authority.

C. Temporary Electricity:

1. Provide all necessary wiring for the Contractor's use.
2. Provide main service disconnect and over-current protection at convenient location.
3. Furnish, locate and install area distribution boxes such that the individual trades may use their own construction type extension cords to obtain adequate power, and artificial lighting at all points where required by inspectors and for safety.
4. Existing receptacles may not be utilized during construction.
5. If existing site lighting is disabled during construction, provide and maintain temporary lighting to exterior work areas.

D. Temporary Sewer Facilities:

1. Prior to starting the work, the Contractor shall furnish, for use of Contractor's personnel on the job, all necessary toilet facilities which shall be secluded from public observation. These facilities shall be either chemical toilets or shall be connected to the Owner's sanitary sewer system.
2. Existing sanitary facilities may not be used.
3. All facilities, regardless of type, shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the work is performed. Adequacy of these facilities will be subject to the Owner's review and maintenance of same must be satisfactory to the Owner at all times.

1.5 First Aid Facilities

- A. The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the Owner and the Owner's personnel.

1.6 Potable Water

- A. The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the Owner who are associated with the work.

1.7 Enclosures and Construction Facilities

- A. Furnish, install and maintain for the duration of construction, all required scaffolds, tarpaulins, canopies, steps, bridges, platforms and other temporary construction necessary for proper completion of the work in compliance with all pertinent safety and other regulations.
- B. All temporary enclosures and sheds located within construction areas or within 30 feet of existing building lines shall be noncombustible, in accordance with ASTM E136. Comply with NFPA 241.

1.8 Parking Facilities

- A. Arrange for temporary surface parking areas for the Contractor's and Contractor's subcontractors' personnel.
- B. When site space is not adequate, provide additional off-site parking.
- C. Maintain all roads, both temporary and permanent, in passable condition for all traffic. Any road blockage shall be coordinated with Engineer, Owner, and governing authorities.

1.9 Removal

- A. Remove temporary above-ground or buried utilities, materials, equipment, services, and construction prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities.
- C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Barricades, Lights and Signals

- A. The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction.
- B. The Contractor will be held responsible for all damage to the work due to failure of barricades, signs and lights 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.
- C. Traffic control devices shall comply with the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways.

Part 2 Not Used

Part 3 Not Used

End of Section

Part 1 General

1.1 Scope

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

1.2 Transportation

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

1.3 Handling

- A. All equipment, materials and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.
- D. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Product Storage and Handling Requirements

Part 1 General

1.1 Scope

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

1.2 Storage and Protection

A. Storage

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

B. Protection

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

Product Storage and Handling Requirements

- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Owner and at no additional cost to the Owner.
- D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel and sheet construction products shall be stored with one end elevated to facilitate drainage.
- E. Unless otherwise permitted in writing by the Owner, building products and materials such as cement, grout, plaster, gypsum board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block and structural tile may be stored outdoors under a properly secured waterproof covering.
- F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3 Extended Storage

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

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

- A. Construction staking shall include all of the surveying work required to layout the work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as ordered by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- B. From the information shown on the Drawings and the information to be provided as indicated under Project Conditions below, the Contractor shall:
 - 1. Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.
 - 2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
 - 3. Stake out the permanent and temporary easements or the limits of construction to ensure that the work is not deviating from the indicated limits.
 - 4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
- C. Baselines shall be defined as the line to which the location of the work is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line.
- D. Record Drawing surveys shall be performed in accordance with Section 01 78 39 – Project Record Documents of these Specifications.

1.2 Project Conditions

- A. The Drawings provide the location and/or coordinates of principal components of the Project. The alignment of some components of the Project may be indicated in the Specifications. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.
- B. The survey points, control points, and baseline to be provided to the Contractor shall be limited to only that information which can be found on the Project site by the Contractor.

1.3 Quality Assurance

- A. The Contractor shall furnish documentation, prepared by a surveyor currently registered in the State in which the Project is located, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire, at the Contractor's own expense, a currently registered surveyor, acceptable to the Owner, to provide ongoing construction staking or confirmation of such.
- B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.

1.4 Site Work

- A. Staking Precision: The precision of construction staking shall match the precision of a component's location indicated on the Drawings. Staking of utilities shall be done in accordance with generally accepted practice for the type of utility.
- B. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with plan grades shall be identified by the Contractor and confirmed by the Engineer prior to constructing the base.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Work Included

- A. Section includes requirements for cleanup, re-stabilization, restoration, and disposal to maintain a safe and well-kept job site and properly repair disturbed areas.

1.2 Quality Assurance

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

1.3 Cleaning Materials and Equipment

- A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.
- B. Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

1.4 Cleaning During Construction

- A. (For Interior Areas) Proceed with construction cleanup concurrently with construction progress.
 - 1. Remove mud, oil, grease, soil, gravel, trash, scrap, debris, and excess materials that are unsightly or may cause accidents to persons or properties.
 - 2. Remove water from floor areas where electrical power tools are to be used, and prevent stains on concrete that will be exposed in finish work.
 - 3. Select and employ cleaning materials and equipment with care to avoid scratching, marring, defacing, staining, or discoloring surfaces cleaned.
- B. (For Exterior Areas) Throughout all phases of construction, including suspension of work, and until the Final Acceptance, the Contractor shall keep the site clean and free from rubbish and debris. The Contractor shall also abate dust nuisance by cleaning, sweeping and sprinkling with water, or other means as necessary. The

use of water resulting in mud on driveways, parking lots or streets will not be permitted as a substitute for sweeping or other methods.

1. The road(s) on the construction site shall be paved immediately after the installation of underground utilities and the construction and underground/final inspection of storm drainage, curbs, and gutters. The exit road on the construction site shall be paved first.
 2. Vehicles exiting the construction site shall have all dirt clods and mud removed from their tires.
 3. Materials and equipment shall be removed from the site as soon as they are no longer necessary. Before the final inspection, the site shall be cleared of equipment, unused materials and rubbish so as to present a satisfactory clean and neat appearance. All cleanup costs shall be included in the Contractor's Bid.
 4. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area cleaned.
 5. Excess excavated material from catch basins or similar structures shall be removed from the site immediately. Sufficient material may remain for use as backfill if permitted by the Specifications. Forms and form lumber shall be removed from the site as soon as practicable after stripping.
- C. Failure of the Contractor to comply with the Engineer's cleanup orders may result in an order to suspend work until the condition is corrected. No additional compensation will be allowed as a result of such suspension.

1.5 Final Cleaning

- A. Upon completion of the work, the Contractor shall remove from the site all plant, materials, tools and equipment belonging to him, and leave the site with an appearance acceptable to the Owner.
- B. Thoroughly clean all equipment and materials installed and deliver over such materials and equipment in a bright, clean, polished and new appearing condition.
- C. Restore or replace all landscape features scarred or damaged by the Contractor's equipment or operations as nearly as possible to original condition, at the Contractor's expense. The Owner will approve the method of restoration to be used.
- D. The Contractor shall remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction, as directed by the Owner. It is anticipated that excavation, filling and plowing of roadways will be

required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The restored areas shall be filled, graded, and spread with sufficient topsoil to provide a minimum depth of four inches of suitable soil for the growth of grass, and the entire area shall be seeded or sodded with the original type of grass. Areas shall be restored to original contours as shown on the Plans. If the Plans do not cover the specific areas to be restored, the areas shall be graded to drain and give a smooth transition to the surroundings.

1.6 Disposal of Waste

- A. The definitions contained in Georgia Environmental Protection Division Rules 391-3-4-.01 shall be applicable to this Project. The term waste shall include excess and surplus materials, and shall include liquid and solid wastes.
- B. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- C. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
- D. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.
- E. Burning: Do not burn waste materials on site.
- F. Waste removed from the Project site shall be disposed of in sites permitted by the Georgia Environmental Protection Division for the acceptance of type of waste being disposed. The acceptable types of permitted disposal facilities are as follows:
 - 1. Inert Waste Landfills
 - 2. Municipal Solid Waste Landfills
 - 3. Municipal Solid Waste Landfills permitted to receive only construction and demolition wastes.
- G. Exceptions to Paragraph F are as follows:
 - 1. Hazardous waste shall be disposed of in accordance with Georgia Environmental Protection Division Rules 391-3-11.
 - 2. Asbestos-containing waste shall also be handled and disposed of in accordance with Georgia Environmental Protection Division Rules 391-3-14.

3. Excess earth material and excess excavated rock material may be placed on sites for which the Contractor provides to the Owner a signed affidavit from the property owner that the placement of such material is acceptable to the property owner. The Contractor and property owner shall be responsible for all permitting of such disposal.
- H. No waste shall be placed at a transfer station facility.
- I. The Contractor shall maintain records related to all waste removed from the Project site so as to allow the Owner or the Engineer to readily determine the following:
1. Date waste removed from Project site.
 2. Name of hauler (company and driver) transporting such waste.
 3. General description of waste transported.
 4. "Truck tickets" indicating the waste disposal site and amount of waste disposed therein.

Part 2 Products

(NOT USED)

Part 3 Execution

(NOT USED)

END OF SECTION

Part 1 General

1.1 Project Maintenance and Warranty

- A. Maintain and keep in good repair the work covered by these Drawings and Specifications until acceptance by the Owner.
- B. The Contractor shall warrant for a period of one year from the date of Owner's written final acceptance of the Project, as defined in the Contract Documents, that the completed work is free from all defects due to faulty products or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect throughout the warranty period.
- C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.
- D. In the event of multiple failures of major consequences prior to the expiration of the one year warranty described above, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new 12-month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken 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 rewarranted for one year.
- E. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of

Warranties and Bonds

the work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.

- F. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.
- G. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.
- H. In the event the Contractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.
- I. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.
- J. 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

(NOT USED)

END OF SECTION

Part 1 General

1.1 Scope

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

1.2 Maintenance of Documents and Samples

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

Record Documents

- E. Failure to maintain the Record Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.3 Quality Assurance

- A. Unless noted otherwise, Record Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.
- B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.
- C. The Contractor shall employ a registered surveyor to prepare the Record Drawings from a post-construction, field run survey. The Record Drawings shall provide elevations to the nearest 0.01 foot for all manhole inverts, manhole frames and other pertinent items constructed by the Contractor. In addition to newly constructed items, the Contractor shall record the locations, by field run survey meeting the precision tolerances listed above, of any existing manhole which rehabilitation work was performed or any existing manhole which is adjacent to a sewer segment which rehabilitation work was performed. The Record Drawings shall provide dimensions, distances, and coordinates to the nearest 0.01 foot and horizontal angles to the nearest 10 seconds.

1.4 Recording

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

1.5 Record Drawings

- A. 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.
- 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 constructed and those utilities encountered, referenced to permanent surface improvements.
 - b. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.
 - c. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.
3. Structures
 - a. Depths of various elements of foundation in relation to finish first floor datum or top of wall.
 - b. Location of internal and buried utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

1.6 Specifications

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

1.7 Submittal

- A. At contract closeout, deliver Record Documents to the Engineer for 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

Part 1 General

1.1 Work Included

- A. Demolition of designated structures, foundations, mechanical equipment, electrical equipment, piping, utilities, and other existing facilities.
- B. Unless otherwise noted, removal all demolition material from the project site and properly dispose of all demolition material at a location selected and provided by the Contractor.
- C. As noted, remove and salvage equipment and facilities for reuse on this project and/or for delivery to the Owner for Owner's future use.

1.2 Related Sections

- A. Section 01 11 00 - Summary of Work.

1.3 Demolition Plan

- 1. Prepare a Demolition Plan and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified and a detailed description of methods and equipment to be used for each operation. Plan shall be approved by Engineer prior to work beginning.
- 2. General Requirements: Do not begin demolition or deconstruction until authorization is received from the Engineer. Remove rubbish and debris from the project site; do not allow accumulations.

1.4 Items to Remain in Place

- A. Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damaged items as approved by the Engineer. Coordinate the work of this section with all other work indicated.
- B. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Engineer prior to performing such work.

- C. Do not overload pavements to remain.
- D. Existing Construction Limits and Protection: Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.
 - 1. Weather Protection: For portions of the building to remain, protect building interior and materials and equipment from the weather at all times.
 - 2. Trees: Protect trees within the project site which might be damaged during demolition, and indicated to be left in place, in accordance with local ordinances. If no local ordinances govern tree protection, provide a minimum 4 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Engineer.
 - 3. Utility Service: Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Owner and disconnected and sealed by the Contractor.
- E. Facilities:
 - 1. Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.
 - 2. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Engineer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5 Burning

- A. The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.6 Submittals

- A. Submit the following in accordance with Section 01 33 00 - Submittal Procedures:
- B. Demolition Plan

1.7 Quality Assurance

- A. Comply with federal, state, and local hauling and disposal regulations.
- B. Use of explosives will not be permitted.
- C. Dust Control: Prevent the spread of dust and avoid the creation of a nuisance in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.8 Protection

- A. Protection of Personnel: Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.9 Relocations

- A. Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Engineer.

1.10 Existing Conditions

- A. It shall be the contractor's responsibility to test the existing piping and equipment for lead content before demolition. Samples shall be tested at a qualified laboratory utilizing ASTM E-1979-12 and EPA SW846 7000B procedures for preparation and analysis. If samples indicate lead content in excess of 600ppm the contractor shall comply with all local, state, and federal requirements for personnel safety, lead abatement, and disposal.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 Existing Facilities to be Removed

A. Utilities and Related Equipment

1. General Requirements: Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Engineer. Do not begin demolition work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.
2. Disconnecting Existing Utilities: Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Engineer. When utility lines are encountered but are not indicated on the drawings, notify the Engineer prior to further work in that area. Remove meters and related equipment and deliver to Owner in accordance with instructions of the Engineer.

B. Paving and Slabs

1. Remove sawcut concrete and asphaltic concrete paving and slabs as indicated. Provide neat sawcuts at limits of pavement removal as indicated.
2. Pavement and slabs shall be removed from the site at Contractor's expense.

C. Mechanical Equipment and Fixtures

1. Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit.
2. Do not remove equipment until approved.

D. Piping: Disconnect piping at unions, flanges and valves. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Purge piping to be demolished or abandoned in place and properly dispose of the contents. Carefully dismantle piping that previously contained chemicals including chlorine gas or chlorine and sulfur dioxide solution, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property.

E. Utilities and Related Equipment: Do not demolish existing utilities until all active services have been disconnected. Shut off and cap utilities for future use, as indicated on the Drawings or described elsewhere in these Specifications.

F. The Contractor will be responsible for any damage caused to other structures, and

shall be held liable for any and all repairs, replacement of parts or renovations required to restore any structure, portion of structure, equipment or items, not intended for demolition. The Contractor shall restore any damaged facilities to their condition prior to demolition provided the damage was a result of the demolition. If the Contractor does not repair any such damage immediately, or if the repairs are not suitable to the Owner, the Owner reserves the right to have such repairs made by another party and deduct the cost of required repairs from money due Contractor.

3.3 Disposition of Material

- A. Title to Materials: Except for salvaged items, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Owner's property. Title to materials resulting from demolition, and materials and equipment to be removed, is vested in the Contractor upon approval by the Engineer of the Contractor's demolition and removal procedures, and authorization by the Engineer to begin demolition and deconstruction. The Owner will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.
- B. Salvaged Materials and Equipment: Remove materials and equipment that are indicated to be removed by the Contractor and that are to remain the property of the Owner, and deliver to the owner for storage onsite.
- C. Unsalvageable and Non-Recyclable Material: Dispose of unsalvageable and non-recyclable noncombustible material off-site in accordance with appropriate regulations.

3.4 Cleanup

- A. Remove debris and rubbish. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 Disposal of Removed Materials

- A. Regulation of Removed Materials: Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations in accordance with all applicable federal, state and local regulations.

END OF SECTION

Part 1 General

1.1 Summary

- A. Section Includes:
 - 1. Concrete formwork.
- B. Related sections:
 - 1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
 - 2. It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.

1.2 References

- A. Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
- B. American Concrete Institute (ACI):
 - 1. 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
 - 2. 318/318R, Building Code Requirements for Reinforced Concrete.
 - 3. 347, Formwork for Concrete.

1.3 Design Requirements

- A. Design, erect, shore, brace, and maintain formwork in accordance with ACI 301, ACI 347, and ACI 318 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads. Provide concrete finishes specified in Section 03 30 00 - Cast-In-Place Concrete.
 - 1. Formwork shop drawings shall be prepared by or under the supervision of a qualified professional engineer licensed in the state of the work.
- B. When high range water reducer (superplasticizer) is used in concrete mix, forms shall be designed for full hydrostatic pressure per ACI 347.
- C. Make joints in forms tight enough to prevent loss of concrete mortar.
- D. Limit panel deflection to 1/360th of each component span to achieve tolerances specified.

1.4 Submittals

A. Shop Drawings:

1. Form Ties-Tapered Through-Bolts: Proposed method of sealing form tie hole; coordinate with details shown.
2. All formwork erection, shoring and removal are the responsibility of the Contractor and/or the qualified professional engineer the contractor used for the formwork drawings.
3. Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing re-shoring.
4. Manufacturer's Data for the Following Product: Form release agent.
5. Formwork drawings shall be signed and sealed by the professional engineer licensed in the state of the work and responsible for their preparation.

B. Samples: One each as follows:

1. Form ties.

1.5 Qualifications

- ### A. Formwork Designer: Formwork, falsework, and shoring design shall be by a Qualified Professional Engineer licensed in the state of the work.

Part 2 Products

2.1 Form Materials

A. Wall Forms and Underside of Slabs:

1. Materials: Plywood, hard plastic finished plywood, overlaid waterproof particle board, or steel in "new and undamaged" condition, of sufficient strength and surface smoothness to produce specified finish.
2. Circular Structures:
 - a. Conform forms to circular shape of structure.
 - b. Straight panels may be substituted for circular forms provided panels do not exceed 2' in horizontal width and angular deflection is no greater than 3-1/2° per joint.

- #### B. Painted Surface Forms: High density overlay plywood for flat concrete surfaces to be painted.

-
- C. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. Furnish on exposed surfaces and interior surfaces.
 - D. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit. Permitted to furnish on below grade exterior surfaces
 - E. Forms for Cylindrical Columns, Pedestals, and Supports: Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
 - F. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
 - G. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
 - H. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
 - I. Form Release Agent:
 - 1. Material: Release agent shall not bond with, stain, or adversely affect concrete surfaces, and shall not impair subsequent treatments of concrete surfaces when applied to forms. A "ready to use" water based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations and can be used in potable water facilities.
 - 2. Manufacturers and Products:
 - a. Master Builders, Inc.; Rheofinish 211.
 - b. Cresset Chemical Company; Crete-Lease 20-VOC.
 - c. US Mix Products Company; US SPEC Slickote.
 - d. Or approved equal.
 - J. Rustication Grooves and Beveled Edge Corner Strips: Nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces.
 - K. Form Ties:
 - 1. Material: Steel
 - 2. Spreader Inserts:
 - a. Conical or spherical type.

- b. Design to maintain positive contact with forming material.
 - c. Furnish units that will leave no metal closer than 1" to concrete surface when forms, inserts, and tie ends are removed.
3. Wire ties not permitted.
4. Flat bar ties for panel forms furnish plastic or rubber inserts with minimum 1" depth and sufficient dimensions to permit patching of tie hole.
5. Water Stop Ties: For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one of the following:
- a. Integral steel water stop 0.103" thick and 0.625" in diameter tightly and continuously welded to tie.
 - b. Neoprene water stop 3/16" thick and 15/16" diameter whose center hole is 1/2-diameter of tie, or molded plastic water stop of comparable size.
 - c. Orient water stop perpendicular to tie and symmetrical about center of tie.
 - d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.
6. Through-Bolts: Tapered minimum 1" diameter at smallest end.
7. Elastic Vinyl Plug:
- a. Design and size of plug to allow insertion with tool to enable plug to elongate and return to original length and diameter upon removal forming watertight seal.
 - b. Manufacturer and Product: Dayton/Richmond Co., Miamisburg, OH; A58 Sure Plug, or approved equal.
 - c. Recess plug 1" minimum and grout over hole. See Section 03 60 00 - Grout.

Part 3 Execution

3.1 Form Surface Preparation

- A. Thoroughly clean form surfaces that will be in contact with concrete or that have been in contact with previously cast concrete, dirt, and other surface contaminants prior to coating surface.
- B. Exposed Wood Forms in Contact with Concrete: Apply form release agent as recommended by the manufacturer.

- C. Steel Forms: Apply form release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.

3.2 Erection

- A. General: Unless specified otherwise, follow applicable recommendations of ACI 347.
- B. Beveled Edges (Chamfer):
 - 1. Form 3/4" bevels (chamfers) at all exposed concrete edges, unless otherwise shown.
- C. Wall Forms
 - 1. Do not reuse forms with damaged surfaces.
 - 2. Locate form ties and joints in an uninterrupted uniform pattern.
 - 3. Inspect form surfaces prior to installation to assure conformance with specified tolerances.
- D. Forms For Curbs And Sidewalks
 - 1. Provide standard steel or wood forms.
 - 2. Set forms to true lines and grades, and securely stake in position.
- E. Form Tolerances: Provide forms in accordance with ACI 117, 347 and 318 and the following tolerances for finishes specified:
 - 1. Wall Tolerances:
 - a. Straight Vertical or Horizontal Wall Surface: Flat planes within tolerance specified.
 - b. Wall Type W-A:
 - 1) Plumb within 1/4" in 10' or within 1" from top to bottom for walls over 40 feet high.
 - 2) Depressions in Wall Surface: Maximum 5/16" when 10' straightedge is placed on high points in all directions.
 - c. Wall Type W-B:
 - 1) Plumb within 1/8" in 10' or within 1/2" from top to bottom for walls over 40' high.
 - 2) Depressions in Wall Surface: Maximum 1/8" when 10' straightedge is placed on high points in all directions.

2. Thickness: Maximum $-1/4"$ or $+1/2"$ from dimension shown.
3. Form Offset: Between adjacent pieces of form work, facing material shall not exceed $1/8"$ where exposed to public view and $1/4"$ maximum for all other conditions.

3.3 Additional Requirements

- A. Construct forms tight enough to prevent loss of concrete mortar.
- B. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses and the like for easy removal.
 2. Do not use rust-stained steel form-facing material.
 3. Use only form or form-tying methods which do not cause spalling of the concrete upon form stripping or tie removal.
- C. Set edge forms, bulkheads and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- D. Provide temporary 12 inch wide x 18 inch high openings for cleanouts and inspection ports every 7 feet at the bottom of each lift form and where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations, where possible.
- E. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds and bulkheads required in the Work.
 1. Determine sizes and locations from trades providing such items.
 2. Openings shall be of sufficient size to permit final alignment of pipes or other items without deflection or offsets of any kind. Allow space for packing where items pass through the wall to ensure watertightness. Provide openings with continuous keyways and waterstops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2 inches clear from the opening surfaces and encased items.
- F. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before placing concrete.
- G. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

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- H. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions before placing reinforcement.
- I. Embedded Items.
1. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions and directions furnished with items to be embedded.
 - a. Install anchor bolts/rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - b. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles and other conditions.
 - c. Check special castings, channels or other metal parts that are to be embedded in the concrete prior to and again after placing the concrete.
 - d. Check nailing blocks, plugs and strips necessary for the attachment of trim, finish and similar work prior to placing the concrete.
- J. Pipes and wall spools cast in concrete.
1. Install wall spools, wall flanges, and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools or anchors to the reinforcing steel.
 2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement will occur during construction.
 3. Pipes or spools located below operating water level shall have waterstop ring collars and shall be cast in place. Do not block out such piping and grout after the concrete section is cast. Pipes fitted with thrust rings shall be cast in place.
- K. Removing and reusing forms.
1. General: Do not remove forms from concrete which has been placed with outside temperature below 50°F without first determining and verifying with Engineer if the concrete has properly set without regard for time. Do not apply loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.
 - a. Leave formwork for structural slabs, beams and other structural elements that support weight of concrete in place until concrete has achieved 100% of its design compressive strength and a minimum of 14 days.

- b. Formwork for sides of beams, walls, columns and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50°F for 48 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - c. For structures with a structural roof slab, leave bracing for walls until the roof slab concrete reaches 100% of its design compressive strength and a minimum of 14 days.
 - d. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 2. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
 3. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved in writing by the Engineer.
- L. Aluminum surfaces in contact with concrete.
 1. Aluminum surfaces in contact with concrete or grout or dissimilar metals shall be protected with a Mylar isolator, bituminous paint or other material approved by Engineer.
- M. Shores and reshores.
 1. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation and removal of shoring and reshoring.
 - a. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
 2. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
 3. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

END OF SECTION

Part 1 General

1.1 Summary

- A. Section includes:
 - 1. Waterstops
 - 2. Joint Fillers
 - 3. Vapor Barriers
 - 4. Floor Slab Treatments

1.2 References

- A. ASTM International (ASTM):
 - 1. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
 - 2. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 3. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
 - 4. ASTM D747 - Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
 - 5. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - 6. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness.
- B. U. S. Army Corps of Engineers (USACE):
 - 1. CRD-C-572, Specification for Polyvinyl Chloride (PVC) Waterstop.

1.3 Submittals

- A. Product Data: Provide sufficient information on each type of material for review to determine conformance of material to requirements specified.
 - 1. Waterstops: Complete physical characteristics.
 - 2. Preformed expansion joint material.

- B. Laboratory test reports: Indicating that average properties of waterstop materials and finish conform to requirements specified in this Section.
- C. Certificates of Compliance:
 - 1. Written certificates that polyvinyl chloride waterstops supplied on this Project meet or exceed physical property in accordance with USACE CRD-C-572 and the requirements of this Section.
- D. Manufacturer's instructions: For materials specified in this Section that are specified to be installed with such instructions.

1.4 Quality Assurance

- A. Materials:
 - 1. PVC waterstops: Shall be free of misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. Replace faulty material.
- B. Inspections:
 - 1. Waterstop: For installation according to manufacturer's recommendations.
 - 2. Vapor Barriers: For installation according to the drawings and free from tears.
 - 3. Joint Filler: Joints shall be free of debris prior to placing joint filler.
 - 4. Floor Slab Treatment: For installation according to manufacturer's recommendations.

Part 2 Products

2.1 Waterstops

- A. Polyvinyl chloride (PVC) Waterstops:
 - 1. General: Manufactured from polyvinyl chloride plastic compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of this Section. No scrap or reclaimed material shall be used.
 - 2. Manufacturers: One of the following or approved equal:
 - a. Greenstreak Plastic Products Company, Inc.
 - b. Vinylex Corporation.
 - 3. Type: Ribbed with Center bulb (non-tapered):

- a. Construction and Expansion joints: 6-inch long.
 - 1) Greenstreak Style 732
 - 2) Vinylex RB638H
 - b. Expansion joints: 9-inch long
 - 1) Greenstreak Style 735
 - 2) Vinylex RB938H
4. Dumbbell type waterstop will not be allowed unless otherwise specified or indicated on the Drawings.
- B. Strip-Type Waterstops:
1. General: Unless noted otherwise, strip-type waterstops shall be:
 - a. Expansive type only when waterstop is placed between two layers of reinforcing.
 - b. Non-Expansive type for all other conditions.
 2. Expansive Strip-type Waterstops Profile: 1" x 3/4"
 - a. General: Manufactured from expansive butyl rubber compound. No scrap or reclaimed material shall be used.
 - b. Install only at locations as shown on the drawings or as directed by the Engineer.
 - c. Expansive strip-type waterstops shall be installed inside of, or between, reinforcing bars, where applicable. Maintain manufacturer's minimum cover requirements at all times.
 - d. Greenstreak Swellstop
 - e. Vinylex BlueStop
 3. Non-expansive Strip-type Waterstops Profile: 1" x 3/4"
 - a. General: Self-sealing mastic waterstop. No scrap or reclaimed material shall be used.
 - b. Install only at locations as shown on the drawings or as directed by the Engineer.
 - c. Maintain manufacturer's minimum cover requirements at all times.

- d. Greenstreak Lockstop
- e. Vinylex UltraStop

2.2 Joint Fillers

- A. Expansion and Isolation Joint Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D2240.
- C. Preformed expansion joint materials: No scrap or recycled material shall be used.
 - 1. Bituminous fiber expansion joint material equal to:
 - a. Tamms Industries: Hornboard/fiber.
 - 2. Synthetic sponge rubber expansion joint material equal to:
 - a. Tamms Industries: Cementone.

2.3 Vapor Barriers

- A. Plastic Vapor Barrier: ASTM E1745, Class B. Include manufacturers' recommended adhesive or pressure-sensitive tape. Minimum thickness: 15 mils.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.4 Floor and Slab Treatments

- A. General: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.5 Bonding Agents

- A. Bonding Agent: ASTM C1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing for bonding hardened or freshly mixed concrete to hardened concrete.

Part 3 Execution

3.1 Waterstops - Installation

- A. Waterstops shall be stored so as to permit free circulation of air around the waterstop material and to prevent direct exposure to sunlight.
- B. Carry waterstops in walls into lower slabs and join to waterstops in slabs with appropriate types of fittings.
- C. In water-bearing structures: Provide all joints with waterstops, whether indicated on the Drawings or not.
- D. Hold and securely fix edges in position at intervals of not more than 24 inches so that they do not move during placing of concrete.
- E. Do not drive nails, screws, or other fasteners through waterstops in vicinity of construction joints.
- F. Terminate waterstops 3 inches from top of finish surfaces of walls and slabs unless otherwise shown on the Drawings.
- G. Weld joints such as unions, crosses, ells, and tees, with thermostatically controlled equipment recommended by waterstop manufacturer:
 - 1. The material shall not be damaged by heat sealing.
 - 2. Make joints by overlapping, cut the ends of the sections to be spliced so they will form a smooth even joint. Heat the cut ends with the splicing tool until the plastic melts. Press the two ends together until the plastic cools.
 - 3. The continuity of the waterstop ribs and tubular center axis shall be maintained.
 - 4. The splices shall have a tensile strength of not less than 60 percent of the unspliced materials tensile strength.
- H. Butt joints of the ends of two identical waterstop sections may be made while the material is in the forms.
- I. Joints for crosses and tees shall be factory prefabricated by the manufacturer.

3.2 Vapor Retarders

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E1643 and manufacturer's written instructions.
- B. Lap joints 6 inches or as required by the manufacturer and seal with manufacturers' recommended tape.

3.3 Joints

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Preformed expansion joint material: Fasten expansion joint strips to concrete, masonry, or forms with adhesive. No nailing will be permitted, nor shall expansion joint strips be placed without fastening.
- C. Construction Joints:
 - 1. Install so strength and appearance of concrete are not impaired.
 - 2. Provide joints only as indicated on the drawings or as approved by the Engineer.
 - 3. All joints in hydraulic structures to have waterstops.
 - 4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- D. Contraction Joints in Slabs-on-Grade:
 - 1. Form weakened-plane contraction joints, in slabs-on-grade only as indicated on the drawings.
 - 2. No slabs for hydraulic structures shall have contraction joints, unless indicated otherwise on the drawings.
 - 3. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 4. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/4-inch wide joints maximum into concrete, when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- E. Isolation Joints in Slabs-on-Grade:
 - 1. Extend joint filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - 2. Terminate full-width joint filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants are indicated, specified in Division 07 Section "Joint Sealants".
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

F. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated. Lubricate or epoxy-coat one-half of dowel length to prevent concrete bonding to one side of joint.

G. Joint Filling

1. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - a. Defer joint filling until concrete has aged at least 30 days. Do not fill joints until construction traffic has permanently ceased.
2. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
3. Install semi-rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.4 Liquid Floor Treatments

A. Penetrating Liquid Floor Treatment:

1. Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
2. Do not apply to concrete that is less than 28 days old.
3. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
4. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

END OF SECTION

Part 1 General

1.1 Summary

A. Section Includes:

1. Reinforcing steel and related items required for cast-in-place concrete.

B. Related Sections:

1. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
2. It is the Contractor's responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of Contractor's Work.

1.2 References

A. American Concrete Institute (ACI):

1. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials
2. ACI 318 - Building Code Requirements for Structural Concrete and Commentary
3. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary

B. Concrete Reinforcing Steel Institute (CRSI) - Manual of Concrete Practice

1.3 Supervision

A. Workmanship: Provide qualified supervision at all times reinforcing work is in progress. Workmen shall be experienced iron workers.

B. Codes: Reinforcement placement and detailing shall comply with practice specified in the "Manual of Standard Practice for Detailing Reinforced Concrete Structures" publication ACI 315- latest edition of the American Concrete Institute or its latest revision, unless otherwise specified herein.

1.4 Submittals

A. Shop drawings: Shop drawings shall be prepared for all reinforcement required by the project. Shop drawings shall be logically and legibly prepared to permit reason-

able ease of sorting, selecting, placing reinforcement as well as checking drawings. Preparer and fabricator shall be identified on the drawings.

1. Reinforcement shall not be fabricated until the shop drawings have been processed, approved and returned.
 2. Check all shop drawings to verify reinforcement dimensions required by drawings are satisfied.
 3. Provide bar sizes, bar lengths, bar material, bar grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and lap lengths, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- B. Reinforcement shop drawings:
1. Review of reinforcement shop drawings by the Engineer will be limited to general compliance with the Contract Documents.
 2. Submit reinforcement shop drawings in a complete package for each specific structure. Partial submittals will be rejected.
- C. Changes to reinforcing steel contract drawing requirements:
1. Indicate in separate letter submitted with shop drawings any changes of requirements indicated on the Drawings for reinforcing steel.
- D. Such changes will not be acceptable unless the Engineer has accepted such changes in writing.

1.5 Product Handling

- A. Protection:
1. Use all means necessary to protect reinforcement from dirt and other foreign substances before and after placing.
 2. Store in a neat manner in logical order, bundled, tagged, off the ground, and in an area adequately isolated.
 3. Re-bundle to maintain identification when placing is interrupted.
- B. Replacement: All damaged or improperly fabricated bars shall be replaced at the Contractor's expense.

Part 2 Products

2.1 Concrete Reinforcement

A. General:

1. All reinforcement bars shall be deformed, carbon steel bars in accordance with ASTM A615 Grade 60.
2. All reinforcement shall be free from rust, loose mill scale, and other contaminants.

B. Wire bar supports located between reinforcing bars and face of concrete:

1. Stainless steel. Type 304 stainless steel bar supports.
2. Support reinforcing for concrete placed on ground using bar support chairs with Type 304 stainless steel plates for resting on ground welded to the chairs.

C. Concrete bar supports located between reinforcing bars and face of concrete:

1. Manufactured expressly for supporting reinforcing bars.
2. Manufactured with two annealed steel wires to securely tie concrete bar support to reinforcing steel.
3. Manufactured with f'_c at least 1,000 psi greater than concrete compressive strength.

2.2 Welded Wire Reinforcement (WWR)

A. General:

1. All WWR shall be carbon steel, welded wire in accordance with ASTM A1064.
2. WWR may not be used in place of reinforcing bars unless accepted in writing by the Engineer.
3. Provide WWR in flat sheet form.

2.3 Accessories

- A. General: Accessories shall be subject to Engineer's approval.
- B. Tie wire - 18 gauge annealed steel wire.
- C. Number of chairs shall be adequate to prevent sag during steel and concrete placement.
- D. Wall layer spacers shall be 1/4 inch round "Z" bar.

Concrete Reinforcement

- E. Horizontal layer spacers shall be wire bar supports or reinforcing bars bent to support top layer.
- F. Dowel bar splicer shall be Richmond or approved equal, manufactured from standard specified rebar material, with NC threads and shop fabricated to specified dowel configurations.
- G. Expansion Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
 - 1. All dowels shall be placed and securely anchored before placing concrete. All dowels shall be parallel with each other and perpendicular to the joint.
- H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. Secure all reinforcement in place using steel chairs, supports, "A" bars and any other ACI approved product. Supports shall be spaced adequately to support the steel firmly in place.
 - 3. Chairs will not be accepted to hold reinforcing clearance on walls.

Part 3 Execution

3.1 General

- A. Coordinate all work of other trades to avoid conflict with reinforcement.
- B. Contractor is responsible for checking shop drawings to verify compliance with the drawings. Prior to submitting shop drawings to the Engineer, the contractor shall confirm all bar materials, quantities, sizes, and spacings, as well as all bent bar and lap splice lengths.

3.2 Fabricating

- A. General: Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Reinforcement shall be shop fabricated except where straight bars No. 5 or smaller are required.
- B. Bending: All bending shall be by using bending jigs and mandrels. All bars shall be bent cold.

- C. Cutting: Bars shall be cut by cold shearing. Torch cutting in the field may be permitted in special situations.

3.3 Preparation

A. Surface Preparation:

1. Reinforcing bars: Thin coating of red rust resulting from short exposure will not be considered objectionable. Thoroughly clean any bars having rust scale, loose mill scale, or thick rust coat.
2. Cleaning of reinforcement materials: Remove concrete or other deleterious coatings from dowels and other projecting bars by wire brushing or sandblasting before bars are embedded in subsequent concrete placement.

3.4 Placing

A. General:

1. Accurately place all bars to meet tolerances as outlined in ACI 318 and tie in place before placing concrete, include dowels. Tie with 18 gauge steel wire.
2. Corner bars required for horizontal reinforcing.
3. No field bending of bars will be allowed.

B. Clearance:

1. Preserve clearance between bars of 1 inch minimum, not less than one bar diameter or 1-1/3 times large aggregate, whichever is larger.
2. Clear cover shall be as shown in the drawings.
3. Lap all reinforcing bars with a Class B Tension lap or as required by ACI 318.
4. Stagger splices except where otherwise shown.
5. Lap welded wire reinforcement a minimum of two spaces.

C. Supports:

1. Provide a sufficient number to prevent sagging, to prevent shifting, and to support loads during construction; but in no case less than quantities and at locations as indicated in ACI 315.
2. Do not use brick, broken concrete masonry units, spalls, rocks, wood or similar materials for supporting reinforcing steel.

Concrete Reinforcement

3. Do not use reinforcing bars that have less cover than required by the Contract Documents. Do not adjust location of reinforcement required by the Contract Documents to provide cover to these bars.
 4. Wire chairs will not be accepted to hold reinforcing clearance on walls.
- D. Tying of bar reinforcement:
1. Fasten bars securely in place with wire ties.
 2. Tie bars sufficiently to prevent shifting during construction or concrete placement.
 3. Tie slab bars at every intersection around periphery of slab.
 4. Tie wall bars at not greater than following maximum spacings:

Bar Size	Slab Bar Spacing Inches	Wall Bar Spacing Inches
Bars Number 5 and Smaller	60	48
Bars Number 6 through Number 9	96	60
Bars Number 10 and Number 11	120	96

5. After tying wire ties, bend ends of wire ties in towards the center of the concrete section.
 - a. The cover for wire ties shall be the same as the cover requirements for reinforcing bars.
- E. Openings and obstructions:
1. Place additional reinforcing around openings as shown on the drawings and standard details.
 2. Consult Engineer on special situations.
- F. Welded Wire Reinforcement:
1. Install necessary supports to keep WWR in place while concrete is being placed.
 2. Straighten fabric to make flat sheet before placing.
 3. Splice fabric in accordance with ACI 318.

END OF SECTION

Part 1 General

1.1 Extent of The Work

- A. The extent of concrete work is shown on the Drawings.

1.2 Quality Assurance

- A. Comply with the provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
 - 1. ACI 301, Specifications for Structural Concrete for Buildings.
 - 2. ACI 302, Guide for Concrete Floor and Slab Placement.
 - 3. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - 4. ACI 305, Hot Weather Concreting.
 - 5. ACI 306, Cold Weather Concreting.
 - 6. ACI 308, Standard Practice for Curing Concrete.
 - 7. ACI 315, Detailing Manual.
 - 8. ACI 318, Building Code Requirements for Reinforced Concrete.
 - 9. ACI 347, Recommended Practice for Concrete Formwork.
 - 10. ACI 350, Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - 11. CRSI Manual of Standard Practice.
- B. The Contractor is responsible for correcting concrete work that does not conform to the specified requirements, including requirements for strength, tolerances, and finishes. Correct deficient concrete as directed by the Engineer.
- C. Materials and installed work may require testing and retesting, as directed by the Engineer and paid for by the Soils and Concrete Testing Cash Allowance. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be done at the Owner's expense, including the retesting of rejected materials and installed work, shall be done at the Contractor's expense.

1.3 Submittals

- A. Comply with applicable requirements of Section 01 33 00.

- B. Submit manufacturer/supplier certifications for aggregate and cement. Provide the project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, materials manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results.
- C. Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing and sealing compounds, and others requested by the Engineer.
- D. Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with the ACI 315, Detailing Manual, showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Show on the shop drawings special reinforcement required and openings through concrete structures.
- E. Submit mix design in accordance with ACI requirements. Provide for each mix design, the project name, city, general contractor, concrete strength, and its intended use.
- F. Submit 2 copies of laboratory test reports with standard deviation analysis or trial batch data. All concrete materials shall be listed.
- G. Submittals shall be approved by the Engineer prior to procurement or fabrication of materials.

Part 2 Products

2.1 Form Materials

- A. Forms for Exposed Finish Concrete: Unless otherwise specified or shown on the Drawings, construct formwork for exposed concrete surfaces with plywood, metal, metal framed plywood, or other panel type materials acceptable to the Engineer in order to provide exposed surfaces that are continuous, straight, and smooth. To minimize the number of joints and to conform to the joint system shown on the Drawings, furnish panels in the largest practicable sizes. Provide form material that is thick enough to withstand pressure of newly placed concrete without bowing or deflection.
- B. Forms for Unexposed Finish Concrete: For surfaces that will be unexposed in the finished structure, form concrete with plywood, lumber, metal, or other material acceptable to the Engineer. If lumber is used, it shall be dressed on at least two edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form coating compounds that will not bond with, stain, or adversely affect concrete surface and that will not impair subsequent treatments of concrete surfaces to be cured with water or curing compound.

2.2 Reinforcing Materials

- A. Reinforcing Bar: ASTM A615, Grade 60.
- B. Supports for Reinforcement: Provide supports for reinforcement, including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Unless otherwise indicated on the Drawings, use wire type bar supports complying with CRSI recommendations. Wood, brick, and other devices will not be acceptable. Comply with the following:
 - 1. For slabs on grade, where wetted base material will not support chair legs, use supports with sand plates or horizontal runners.
 - 2. For concrete surfaces exposed to view, where leg supports are in contact with forms, provide supports with legs that are hot dip galvanized or protected by either plastic or stainless steel.

2.3 Concrete Materials

- A. Portland Cement: ASTM C150, Type I or I/II. Use only one brand of cement throughout the project, unless otherwise acceptable to the Engineer.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean, fresh, drinkable.
- D. Admixtures
 - 1. Water Reducing Admixture: Eucon WR 75, WR-91 or MR by the Euclid Chemical Company, Pozzolith 220-N by Master Builders, or WRDA 15 by W.R. Grace. The admixture shall conform to ASTM C494, Type A, and not contain more chloride ions than are present in municipal drinking water.
 - 2. Water Reducing, Retarding Admixture: Eucon Retarder 75 by the Euclid Chemical Company or Pozzolith 100 XR by Master Builders. The admixture shall conform to ASTM C494, Type D, and not contain more chloride ions than are present in municipal drinking water.
 - 3. Mid-range Water Reducing Admixture: Eucon MR or Plastol 341 by the Euclid Chemical Company, Polyheed 997 by Master Builders or Daracem SD by W.R. Grace. The admixture shall conform to ASTM C494 Type A.
 - 4. Nonchloride Accelerator: Accelguard 80, Accelguard 90 or NCA by the Euclid Chemical Company or Darex Set Accelerator by W. R. Grace. The admixture shall conform to ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water.

5. Air Entraining Admixture: AEA-92 by Euclid Chemical Corporation, MB AE-90 by Master Builders, or Darex AEA by W.R. Grace. The admixture shall conform to ASTM C260.
6. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
7. Certification: Written conformance to the aforementioned requirements and the chloride ion content will be required from the admixture manufacturer prior to mix design review by the Engineer.

2.4 Related Materials

- A. Contraction/Construction Joint Filler: The joint filler shall be a two (2) component 100% solids compound, with a minimum shore A hardness of 80. Products: Subject to compliance with requirements, provide "Euco 700 or QWIK Joint" by the Euclid Chemical Company, "Sikadur 51 SL" by Sika Chemical Corporation, or MM-80 by Metzger/McGuire.
- B. Moisture Retaining Covering: One of the following, complying with ASTM C171:
 1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene coated burlap.
 4. Waterborne, Membrane Forming Compound: ASTM C309, Type 1, Class B.
- C. Curing and Sealing Compound: Kurez DR VOX or Kurez W VOX by the Euclid Chemical Company, Master Kure 200W by Master Builders or Kure-n-Seal by Sonneborn. The compound shall conform to FS TT C 800A, 30 percent solids content minimum, and have test data from an independent laboratory indicating a maximum moisture loss of 0.030 gram per square centimeter when applied at a coverage rate of 300 square feet per gallon. Manufacturer's certification is required.
- D. Bonding Compound: Euco Weld by Euclid Chemical Company or Weldcrete by the Larsen Company. The compound shall be a polyvinyl acetate, rewettable type.
- E. Epoxy Adhesive: Euco Epoxy No. 452 or No. 620 by Euclid Chemical Company, Sikadur Hi Mod by Sika Chemical Corporation, or Epcon Ceramic 6 by ITW Ramset. The compound shall conform to ASTM C881, be a 2 component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces.
- F. Nonshrink Grout: Euco NS by the Euclid Chemical Company or Masterflow 713 by Master Builders. The grout shall conform to CRD C 621 80, "Corps of Engineers Specification for Nonshrink Grout."

2.5 Mix Design

A. Preparation

1. Prepare design mixes for each type and strength of concrete in accordance with applicable provisions of ACI-318 and ASTM C94. Use an independent testing facility acceptable to the Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same one used for field quality control testing unless this is acceptable to the Engineer. Submit to the Engineer written reports of each proposed mix in accordance with Section 01 33 00.
2. The design mix shall provide normal weight concrete with compressive strength as indicated on the Drawings.

B. Water/Cementitious Ratio:

1. All concrete subject to freezing and thawing shall have a maximum water/cement ratio of 0.45 (4000 psi at 28 days or more). All trowel finished interior slabs, subjected to vehicular traffic, shall have a maximum water/cement ratio of 0.45.

C. Admixtures

1. All concrete slabs placed at air temperatures below 50 degrees F shall contain the specified nonchloride accelerator. All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, fiber concrete, concrete for floor slabs, and concrete with a water/cement ratio below 0.50 shall contain the specified high range water reducing admixture (superplasticizer) or mid-range water reducing admixture.
 - a. Use an air entraining admixture in all concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure:
 - 1) 2.5 percent to 5.5 percent for maximum 2 inches aggregate.
 - 2) 4.5 percent to 7.5 percent for maximum 3/4 inch aggregate.
 - 3) 5.5 percent to 8.5 percent for maximum 1/2 inch aggregate.
2. Use the amounts of admixtures recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control.

D. Slump Limits

1. All concrete containing the high range water reducing admixture (superplasticizer) shall have a maximum slump of 8 inches unless otherwise approved by the Engineer. The concrete shall arrive at the job site at a slump

of 2 inches to 3 inches and be verified; then the high range water reducing admixture shall be added to increase the slump to the approved level.

2. All other concrete shall have a maximum slump of 3 inches for slabs and 4 inches for other members.

2.6 Proportioning

A. Ready Mix Concrete

1. Comply with the requirements of ASTM C94 and of these specifications.
2. During hot weather or under conditions that contribute to rapid setting of concrete, a shorter mixing time than that specified in ASTM C94 may be required. When the air temperature is between 85 degrees and 90 degrees F, reduce the mixing and delivery time from 1 1/2 hours to 75 minutes; when the air temperature is above 90 degrees F, reduce the mixing time to 60 minutes.
3. Each load of concrete arriving at the job shall be accompanied by a delivery ticket that shall be collected by the Contractor and submitted to the Owner's representative and shall contain the following information:
 - a. The design mix and strength of mix of concrete being delivered.
 - b. The exact time the cement, aggregate, and water were discharged into the delivery truck.

Part 3 Execution

3.1 Forms

- A. Design, erect, support, brace, and maintain formwork to support any vertical and lateral loads that may be applied until such loads can be supported by the concrete structure. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Design and construction of form work shall be the responsibility of the Contractor.
- B. Design formwork so that it can be readily removed without impact, shock, or damage to cast in place concrete surfaces and adjacent materials.
- C. Construct forms complying with ACI 347 and ACI SP-4 to the sizes, shapes, lines, and dimensions shown on the Drawings so that in the finished structures the work will be level and plumb and have accurate alignment, location, and grade within the tolerance limits of ACI 301. Provide for openings, offsets, linkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features that the work requires. Use selected materials to obtain the required finishes. Butt joints solidly, and provide backup at joints to prevent leakage of cement paste.

- D. Fabricate forms so that they can be easily removed without hammering or prying against the concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep for the concrete to be placed with bottom forms only. To form keyways, reglets, recesses, and the like, kerf wood inserts to prevent swelling and to permit easy removal.
- E. Where the interior area of formwork is not accessible for cleanout, provide temporary openings to permit concrete placement and inspection before the concrete is placed. Brace temporary openings securely and set them tightly to forms to prevent the loss of concrete mortar. Position temporary openings on forms at inconspicuous locations.
- F. Chamfer exposed corners and edges as shown on the Drawings, using wood, metal, PVC, or rubber chamfer strips fabricated to produce smooth, uniform lines and tight edge joints.
- G. Use metal form ties that are factory made, adjustable in length, designed to prevent form deflection, and either removable or snap off and that will prevent the concrete surface's being spalled when the ties are removed. If snap off ties are used, the portion remaining within the concrete after removal must be at least 1 1/2 inches inside the concrete and be provided with a waterproofing washer unless the Drawings indicate otherwise.
- H. Unless the Drawings indicate otherwise, provide form ties that will not leave holes larger than 1 1/2 inches in diameter in the concrete surface.
- I. Provide openings in concrete formwork to accommodate the work of other trades. Determine the size and location of openings, recesses, and chases from the trades providing such work. Accurately place and securely support items built into forms.
- J. Clean thoroughly forms and adjacent surfaces that are to receive concrete. Remove chips, wood, sawdust, dirt, sediment, and any other debris just before the concrete is placed. After concrete placement, retighten forms if necessary to eliminate mortar leaks.

3.2 Placing Reinforcement

- A. For details and methods of placing reinforcement and supports, comply with the specified codes and standards, the recommended practice of the CRSI as outlined in "Placing Reinforcing Bars," and these specifications.
- B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials that reduce or destroy the bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcement with metal chairs, runners, bolsters, spacers, and hangers as required for security.

- D. Place reinforcement to obtain at least the minimum coverage for concrete protection as required by ACI 318 and ACI 350 as applicable. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so that ends are directed into the concrete, not toward exposed concrete surfaces.
- E. Do not place reinforcing bars more than 2 inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment or similar construction loads.
- F. Install welded wire fabric in lengths that are as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 Joints

- A. Locate and install construction joints, as shown on the Drawings, or specified herein, so that the strength and appearance of the structure will not be impaired.
- B. Provide keyways at least 1 1/2 inches deep in construction joints that are in walls and slabs or between walls and footings. Bulkheads designed for this purpose may be used if accepted by the Engineer. Omit keyway where steel waterstops are shown between walls and footings.
- C. Construct isolation joints in slabs on the ground wherever there is contact between slabs on the ground and vertical surfaces and wherever else indicated on the Drawings.
- D. Install joint filler and sealant materials as specified by the manufacturer.
- E. Construct contraction (control) joints in slabs on ground to form panels of patterns as shown. The soff-cut saw system shall be used immediately after final finishing and to a depth of 1/3 slab thickness. A conventional saw shall be used as soon as possible without dislodging aggregate and to a depth of 1/3 slab thickness, if the initial soff-cut did not achieve the 1/3 depth.
- F. Install semi-rigid joint filler or joint sealant in accordance with the direction of the manufacturer.
- G. The maximum joint spacing (in feet) of slabs on grade shall be 30 times the slab thickness (in inches) unless otherwise shown on the Drawings.

3.4 Installation of Embedded Items

- A. Set and build into the work anchoring devices and other embedded items required for other work that are to be attached to or supported by cast in place concrete. Use setting drawings, diagrams, instructions, and directions provided by the suppliers of the items to be attached thereto.

- B. Set edge forms or bulkheads and intermediate screed strips for slabs in order to provide the elevations and contours in the finished slab surface required by the Drawings. Provide units strong enough to support the types of screed strips used, and secure with strike off templates or compacting screeds accepted by the Engineer.

3.5 Preparation of Form Surfaces

- A. Before placing reinforcement, coat the contact surfaces of forms with a form coating compound.
- B. Thin the form coating compound only with the amount and type of thinning agent and only under the conditions recommended by the compound manufacturer. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply the form coating compound in compliance with the manufacturer's instructions.
- C. Coat steel forms with a nonstaining, rust preventive form oil, or otherwise protect against rusting. Rust stained steel formwork is not acceptable.

3.6 Concrete Placement

- A. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades that the formwork is complete so that they may then install their work; cooperate with other trades in setting such work. Wherever form coatings are not used, wet wood thoroughly just before placing concrete.
- B. Coordinate the installation of joint materials and moisture barriers with the placement of forms and reinforcing steel.
- C. Deposit concrete either continuously or in layers thick enough to prevent its being placed on concrete that has hardened enough to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as close to its final location as practicable in order to avoid segregation due to rehandling or flowing.
- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner that avoids inclined construction joints. Where placement consists of several layers, avoid cold joints by placing each layer while the preceding one is still plastic.
- E. Use mechanical vibrating equipment supplemented by hand spading, rodding, or tamping to consolidate placed concrete. The equipment and procedures used to consolidate the concrete shall comply with the recommended practices of ACI 309 and suit both the type of concrete and project conditions.
- F. Do not use vibrators to transport concrete once it is inside the forms. Insert and withdraw vibrators vertically at uniformly spaced locations no further apart than the

visible horizontal effectiveness of the machine. Limit layer heights so that the vibrator is effective into 6 inches of the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete, and complete embedment of reinforcement and other embedded items without causing segregation of the mix. Lower frequency vibrators may be used with "flowing" concrete.

- G. Until the placing of a panel or section is completed, deposit and consolidate concrete slabs in a continuous operation within construction joints.
- H. Consolidate concrete during placing operations so that it is thoroughly worked around reinforcement and other embedded items and into corners.
- I. Bring slab surfaces to the correct level with a straightedge and strike off. Use highway bull floats or darbies to smooth the surface, leaving it free from humps and hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces before starting finishing operations.
- J. Maintain reinforcement in the proper position during placement operations.
- K. Cold Weather Placement
 1. Comply with ACI 306 and the requirements herein specified to protect concrete work from physical damage or reduced strength due to frost, freezing, or low temperatures.
 2. When the air temperature has fallen or is expected to fall below 40 degrees F, heat all water and aggregates uniformly before mixing so that the concrete, at point of placement, will have a temperature of not less than 50 degrees nor more than 80 degrees F.
 3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 4. Use only the specified nonchloride accelerator. Do not use calcium chloride or admixtures containing more than 0.05 percent chloride ions.
- L. Hot Weather Placement
 1. When the weather is hot enough to impair the concrete's quality and strength, place the concrete as specified herein and in ACI 305.
 2. Cool ingredients before mixing so that when the concrete is placed, its temperature is below 90 degrees F. Mixing water may be chilled, or else a portion of the water may be in the form of chopped ice.
 3. If reinforcing steel becomes hotter than the ambient air temperature, cool it with water soaked burlap so that its temperature will not exceed the ambient air temperature.

4. When high temperatures and/or placing or humidity conditions dictate, the mix may be initially retarded by use of the water reducing, retarding formulation (Type D) of the specified water reducing admixture (Type A).

3.7 Finish of Formed Surfaces

- A. **Rough Form Finishes:** For formed concrete surfaces not exposed to view in the finished work or covered by other construction, use a rough form finish unless otherwise indicated by the Drawings. Repair and patch tie holes and defective areas, and rub down or chip off fins and other projections more than 1/4 inch high.
- B. **Smooth Form Finish:** For formed concrete surfaces that are exposed to view or to be covered with a coating or covering material applied directly to the concrete or a covering material bonded to the concrete (e.g., waterproofing, dampproofing, painting, etc.), use a smooth form finish. This is the as cast finish obtained on the concrete surface when the selected form facing material is regularly and symmetrically arranged with a minimum of seams. Repair and patch defective areas so that all fins and other projections are completely removed and smoothed.
- C. **Rubbed Finish:** At all formed surfaces exposed inside and outside the structure, apply rubbed finish as follows:
 1. **Smooth-Rubbed Finish:** Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. **Related Uniform Finishes:**
 1. At the tops of walls, horizontal offsets, and similar unformed surfaces that are next to formed surfaces, strike off smooth and finish with a texture that matches the adjacent formed surfaces. Unless otherwise shown on the Drawings, continue the final surface treatment of formed surfaces uniformly across adjacent unformed finishes.
- E. **Float Finish**
 1. Apply float finish to monolithic slab surfaces that are to receive a trowel finish or other finishes specified hereinafter; to slab surfaces that are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand bed terrazzo; and as otherwise indicated by the Drawings or schedules.
 2. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened enough to permit the operation of power driven floats or by hand floating if the area is small or inaccessible to power units. Check and level the surface plane so that the surface conforms to the specified FF/FL17 tolerance.
- F. **Trowel Finish**

1. Apply a trowel finish to monolithic slab surfaces that are to be exposed to view, unless otherwise indicated by the Drawings, and to slab surfaces that are to be covered with resilient flooring, paint, or other thinfilm finish coating.
 2. After the slab has received a floated finish, begin first trowel finish operation using a power driven trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over it. Surface shall be troweled until it is free of trowel marks, is uniform in texture and has a smooth dense appearance, and achieves an FF30/FL25 tolerance. Grind smooth any surface defects that would telegraph through the applied floor covering.
- G. Nonslip Broom Finish
1. Apply nonslip broom finish to exterior concrete platforms, steps, and ramps and elsewhere as indicated by the Drawings or schedules.
 2. Immediately after float finishing, roughen the concrete surface slightly by brooming perpendicular to the main traffic route with a fiber bristle broom. Texture shall be as approval by the Engineer from sample panels.
- H. Nonslip Finish: Where the contract documents require a nonslip finish, give the surface a "dry shake" application of crushed ceramically bonded aluminum oxide or other specified selected abrasive particles. The rate of application of such material shall be not less the 25 pounds per 100 SF.

3.8 Curing

- A. After placing and finishing the concrete, start initial curing of concrete as soon as free water has disappeared from concrete surface. Keep continuously moist for not less than 7 days.
- B. Begin final curing immediately after final finishing. Continue final curing for at least 7 days in accordance with ACI 301 and ACI 308. Avoid rapid drying at the end of the final curing period.
- C. Cure concrete by moist curing, moisture retaining cover curing, membrane curing, or combinations of these methods, as specified herein and ACI 308.
- D. Provide moisture curing by one of the following methods:
1. Keep concrete surface continuously wet by covering with water.
 2. Spray it continuously with a water fog.
 3. Cover the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water and keeping it wet; position the absorptive cover so that it covers the concrete surface and edges and laps adjacent absorptive covers by 4 inches.

- E. Provide moisture cover curing by covering concrete surfaces with a moisture retaining cover designed for curing concrete. Place the cover in the widest practicable width of material with sides and ends of the material lapped at least 3 inches and sealed by waterproof tape or adhesive. Repair immediately any holes or tears that occur during the curing period with identical cover material and waterproof tape.
- F. Provide membrane curing to slabs as follows: All interior slabs that have resilient tile or carpet or are left exposed and all exterior slabs, sidewalks, curbs, etc., shall be cured with the specified clear curing and sealing compound. The compound shall be applied immediately after final finishing operations are completed. Apply uniformly in a continuous operation by power spray or roller in accordance with the manufacturer's directions. Areas that are subjected to heavy rainfall within 3 hours after initial application shall be recoated. Maintain continuity of coating, and repair damage during the curing period.
- G. Cure formed concrete surfaces (including undersides of beams, supported slabs, and other similar surfaces) by moist curing with forms in place for the full curing period or until the forms are removed. If forms are removed, continue curing by the methods specified above, as applicable.
- H. Cure unformed surfaces such as slabs, floor topping, and other flat surfaces by the application of the specified curing and sealing compound, strippable curing compound or by a moist curing method approved by the Engineer.

3.9 Removal and Reuse of Forms

- A. Formwork not supporting weight of concrete (e.g., sides of beams, walls, columns, and similar parts of the work) may be removed after curing at a temperature of not less than 50 degrees F 24 hours after the concrete is placed, provided the concrete is hard enough not to be damaged by form removal operations and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete (e.g., beam soffits, joints, slabs, and other structural elements) may not be removed for at least 14 days nor until the concrete has attained a design minimum compressive strength of 28 days. Determine the potential compressive strength of in place concrete by testing the field cured specimens representative of the concrete location or members.
- C. Form facing material may be removed 4 days after concrete placement only if shores and other vertical supports have been arranged to permit it to be removed without loosening or disturbing shores and supports.
- D. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact form surfaces as specified above for new formwork.

- E. When forms are extended for successive concrete placement, clean surfaces thoroughly, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces.

3.10 Miscellaneous Concrete Items

- A. Filling In: Unless the Drawings show otherwise or the Engineer directs, fill in holes and openings left in concrete structures for the work of other trades once that work is in place. Mix, place, and cure concrete as specified herein to blend with in place construction. Provide other miscellaneous concrete filling shown on the Drawings or necessary to complete the work.
- B. Nonshrink Grout: All column base plates, equipment bases, and other locations noted on the structural drawings shall be grouted with the specified nonshrink grout. All exposed grout shall be of the specified nonmetallic type.
- C. Reinforced Masonry: Provide concrete grout for reinforced masonry lintels and bond beams where indicated on the Drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

3.11 Concrete Surface Repairs

- A. Repair and patch defective areas with cement mortar immediately after removing forms.
- B. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete, but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar, thoroughly clean, dampen with water, and apply the specified bonding compound. The cement mortar shall be placed after the bonding compound has dried.
- C. Remove and replace concrete with defective surfaces if these effects cannot be repaired to the satisfaction of the Owner and Engineer. Such surface defects include irregularities of color and texture, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, and fill with dry pack mortar or with precast cement cone plugs secured in place with bonding agent.
- D. Where possible, repair concealed formed surfaces that contain defects which adversely affect the durability of the concrete. If such defects cannot be repaired, remove and replace the concrete.
- E. Test unformed surfaces such as monolithic slabs for smoothness and to verify that the surface plane meets the tolerances specified for each surface and finish. Correct low and high areas as specified herein. Test unformed surfaces sloped to

provide drainage for both trueness of slope and smoothness with a template of the slope specified on the Drawings.

- F. Repair finished unformed surfaces that contain defects which adversely affect durability of the concrete. Such surface defects include crazing, spalling, pop outs, honeycomb, rock pockets, cracks that are more than 0.01 inch wide or that, regardless of width, penetrate either to reinforcement or completely through unreinforced sections, and other objectionable conditions.
- G. After the concrete has cured at least 14 days, correct high areas in unformed surfaces by grinding.
- H. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting them out and refilling with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Engineer.
- I. Repair defective areas (except for random cracks and single holes not more than 1 inch in diameter) by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts, and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete, and apply the specified bonding compound. Place patching concrete after the bonding compound has dried. Mix patching concrete of the same materials to provide concrete of the same type or class as the original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
- J. Repair isolated random cracks and single holes not over 1 inch in diameter by the dry pack method. Groove top of cracks, cut out holes until sound concrete is reached, and clean to remove dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply the specified bonding compound. Place dry pack after the bonding compound has dried. Dry pack shall consist of 1 part portland cement to 2 1/2 parts fine aggregate passing a No. 16 mesh sieve. Mix with no more water than is necessary for handling and placing. Compact dry pack mixture in place, and finish to match adjacent concrete. Keep patched area continuously moist for no less than 72 hours.
- K. All structural repairs shall be made, with prior approval of the Engineer as to the method and procedure, using the specified epoxy adhesive and/or epoxy mortar.
- L. Repair methods not specified above may be used, subject to acceptance by the Engineer.

3.12 Quality Control Testing During Construction

- A. The Contractor will employ a testing laboratory to perform any or all of the tests specified below and to submit reports on these tests. The testing laboratory shall be approved by the Owner and shall be paid for by the Soils and Concrete Testing

Cash Allowance. Sampling and testing for quality control during the placement of concrete may include the following, as directed by the Engineer:

1. Sampling Fresh Concrete: ASTM C172, but modified for slump to comply with ASTM C94.
 2. Slump: ASTM C143; one test for each concrete load at point of discharge and one test of each set of compressive strength test specimens.
 3. Air Content: ASTM C173 volumetric method for lightweight concrete; ASTM C231 pressure method for normal weight concrete; one test for each set of compressive strength test specimens.
 4. Water Content: The water content of freshly mixed concrete will be tested each time cylinders are made and as directed by the Engineer in accordance with AASHTO TP 23, Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying.
 5. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below or when 80 degrees F and above and each time a set of compression test specimens is made.
 6. Compression Test Specimen: ASTM C31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed by the Engineer. Mold and store cylinders of laboratory cured test specimens except when the Engineer requires field cured test specimens.
 7. Compressive Strength Tests: ASTM C39; one set for each 100 cubic yards or fraction thereof of each concrete class placed in any one day or one set for each 5,000 square feet of surface area placed; 2 specimens tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing, if needed.
- B. When the frequency of testing provides less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or, if fewer than 5 are used, from each batch.
- C. The strength level shall be considered satisfactory as long as the averages of all sets of 3 consecutive strength test results equal or exceed the specified strength f'_c , and no individual test result falls below the specified strength f'_c by more than 500 psi.
- D. When the strength of field cured cylinders is less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in place concrete.
- E. Test results will be reported to the Engineer and Contractor in writing on the same day that the test is made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in the

structure, design compressive strength at 28 days, concrete mix proportions and materials, and compressive breaking strength and type of break for both 7 day tests and 28 day tests.

- F. Non-Compliant Test Reports: All test reports indicating non-compliance should be provided immediately to all parties on the test report distribution list.
- G. The testing service will make additional tests of in place concrete when the test results indicate that the required strength level has not been achieved and other characteristics have not been attained in the structure, as directed by the Engineer. The testing service may conduct tests to determine the adequacy of concrete by cored cylinders that comply with ASTM C42 or by such other methods as are directed by the Engineer. The Contractor shall pay for such tests and any additional testing that may be required when concrete is verified to be unacceptable.

END OF SECTION

Part 1 General

1.1 Scope

- A. This section describes materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The contractor shall furnish all materials, equipment and labor necessary to complete the work.
- B. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

1.2 Clearing and Grubbing

- A. Within the limits shown on the Drawings, the site will be cleared and grubbed to prepare for construction.
- B. Clearing
 - 1. All vegetation such as trees, shrubs, brush, logs, upturned stumps and roots of down trees, and other similar items shall be removed and disposed of properly by the Contractor as specified below. Cultivated growth shall be removed and trees felled as necessary within the construction work site and as indicated.
 - 2. Where the tree limb structure interferes with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the appropriate utility.
 - 3. All buildings, fences, lumber piles, trash and obstructions, except utility poles shall be removed and disposed of by the Contractor. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
 - 4. All fences adjoining any excavation or embankment that may be damaged or buried shall be carefully removed, stored and replaced.
- C. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of properly by the Contractor as specified below. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.
- D. Refer also to Section 31 11 00 - Clearing and Grubbing of these Specifications.

1.3 Preliminary Grading

- A. Before beginning construction, the Contractor shall grade the entire work site to conform, in general, to the finish elevations shown on the Drawings. The Drawings show both existing contour elevations and finished contour elevations.

1.4 Testing and Inspection Services

- A. Soil testing will be performed by an independent testing laboratory selected by the Owner. Payment for soil testing shall be made by the Contractor from the "Soils And Concrete Testing" cash allowance.
- B. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with ASTM D 698.
 - 2. Field density tests for each two feet of lift; one test for each 5,000 square feet of fill.
 - 3. Inspecting and testing stripped site, subgrades and proposed fill materials.
- C. The Contractor's duties relative to testing include:
 - 1. Notifying the laboratory of conditions requiring testing.
 - 2. Coordinating with the laboratory for field testing.
 - 3. Providing representative fill soil samples to laboratory for test purposes. Provide 50 pound samples of each fill soil.
 - 4. Paying costs for additional testing performed beyond the scope of that required and for retesting where initial tests reveals non-conformance with specified requirements.
- D. Inspection:
 - 1. Earthwork operations, suitability of excavated materials for fill and backfill, and placing the compaction of fill and backfill is subject to inspection. The Engineer will observe earthwork operations.
 - 2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer to verify suitable bearing and construction.

Part 2 Products (Not Used)

Part 3 Execution

3.1 Preparation

- A. Maintain bench marks, monuments and other reference points. Re-establish, at no cost to the Owner, any such reference points if disturbed or destroyed.

3.2 Clearing

- A. Clear areas required for access to site and execution of work.
- B. Remove trees and shrubs within the area to be cleared.
- C. Clear undergrowth and deadwood, without disturbing subsoil.

3.3 Disposal of Refuse

- A. The refuse resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall any material be left on the Project, shoved onto abutting private properties, or be buried in embankments or trenches on the Project.
- B. No burning is allowed.

END OF SECTION

Part 1 General

1.1 Work Included

- A. Provide labor, materials, equipment and incidentals necessary to perform operations in connection with clearing, grubbing, and disposal of cleared and grubbed materials.

1.2 Definitions

- A. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.
- B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.
- C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2 inches caliper to a depth of 6 inches below subgrade.
- D. Scalping: Removal of sod without removing more than upper 3 inches of topsoil.
- E. Stripping: Removal of topsoil remaining after applicable scalping is completed.
- F. Project Limits: Areas, as shown or specified, within which Work is to be performed.

1.3 Submittals

- A. Submit work plan in accordance with Section 01 33 00.
- B. The limits of clearing, grubbing and stripping are defined in Section 3.3 and detailed on the project plans.

1.4 Quality Assurance

- A. Obtain Owner's approval of staked clearing, grubbing, and stripping limits, prior to commencing clearing, grubbing, and stripping.

1.5 Scheduling and Sequencing

- A. Prepare site only after adequate erosion and sediment controls are in place. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls.

Part 2 Products

(NOT USED)

Part 3 Execution

3.1 General

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Clear, grub, and strip areas actually needed for staging area or site improvements within limits shown or specified. Do not injure or deface vegetation that is not designated for removal.

3.2 Preparation

- A. Mark areas to be cleared and grubbed prior to commencing clearing operations. The Owner shall approve clearing and grubbing limits prior to commencement of clearing operations.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place. Excavate for, and remove, underground utilities indicated to be removed.
 - 1. Arrange with utility owners to shut-off indicated utilities.
- C. Trees and shrubs outside of the clearing limits, which are within 10' of the clearing limits, shall be clearly marked to avoid damage during clearing and grubbing operations.
- D. Remove trees and brush outside the clearing limits, but within the immediate vicinity of the work, upon receipt of approval by the Owner, when the trees or brush interfere with the progress of construction operations.
- E. Clearly mark trees and shrubs within the clearing limits, which are to remain, and protect the trees and shrubs from damage during the clearing and grubbing operations.
- F. The clearing limits shall not extend beyond the Limits of Disturbance indicated on the Drawings.

3.3 Limits

- A. As follows, but not to extend beyond Project limits.
 - 1. Excavation Including Trenches: 5 feet beyond top of cut slopes.
 - 2. Fill:
 - a. Clearing and Grubbing: 5 feet beyond toe of permanent fill.
 - b. Stripping and Scalping: 5 feet beyond toe of permanent fill.

3. Staging Area:
 - a. Clearing: 5 feet beyond perimeter.
 - b. Scalping and Stripping: As shown.
 - c. Grubbing: Around perimeter as necessary for neat finished appearance.
4. Other Areas: As shown.

- B. Remove rubbish, trash, and junk from entire area within project limits.

3.4 Clearing

- A. Clear areas within limits of construction.
- B. Fell trees so that they fall away from facilities and vegetation not designated for removal.
- C. Cut stumps not designated for grubbing flush with ground surface.
- D. Cut off shrubs, brush, weeds, and grasses to within 2 inches of ground surface.

3.5 Site Improvements

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.6 Grubbing

- A. Grub areas within limits of construction.

3.7 Scalping

- A. Do not remove sod until after clearing and grubbing is completed and resulting debris is removed.
- B. Scalp areas within limits shown or specified.

3.8 Stripping

- A. Do not remove topsoil until after scalping is completed.
- B. Strip areas within limits to minimum depths shown or specified. Do not remove subsoil with topsoil.
- C. Stockpile strippings, meeting requirements of Section 31 20 00 – Earth Moving for topsoil, separately from other excavated material.

3.9 Tree Removal Outside Clearing Limits

- A. Remove Trees Within Project Limits:
 - 1. Dead, dying, leaning, or otherwise unsound trees that may strike and damage Project facilities in falling.
 - 2. Trees designated by Owner for removal.
- B. Remove stumps and debris, and if disturbed, restore surrounding area to its original condition.

3.10 Pruning

- A. Remove branches below the following heights: 20 feet above proposed ground level.
- B. Prune as indicated in local ordinances and the tree protection plans.

3.11 Salvage

- A. Saleable logs timber may be sold to Contractor's benefit. Promptly remove from Project site.
- B. Sod with commercial value may be sold to Contractor's benefit. Promptly remove from Project site.

3.12 Disposal

- A. Clearing and Grubbing Debris:
 - 1. Dispose of debris offsite.
 - 2. Burning of debris onsite will not be allowed.
 - 3. Woody debris may be chipped. Chips may be sold to Contractor's benefit or used for landscaping onsite as mulch or uniformly mixed with topsoil, provided that resulting mix will be fertile and not support combustion. Maximum dimensions of chipped material used onsite shall be 1/4-inch by 2 inch. Dispose of chips that are unsaleable or unsuitable for landscaping or other uses with unchipped debris.

4. Limit offsite disposal of clearing and grubbing debris to locations that are approved by federal, state, and local authorities, and that will not be visible from Project.
- B. Scalpings: As specified for clearing and grubbing debris.
- C. Strippings:
1. Dispose of strippings that are unsuitable for topsoil or that exceed quantity required for topsoil offsite.
 2. Stockpile topsoil in sufficient quantity to meet Project needs. Dispose of excess strippings as specified for clearing and grubbing.
- D. Completely remove timber, logs, roots, brush, rotten wood, and other refuse from the Owner's property. Disposal of materials in streams shall not be permitted and no materials shall be piled in stream channels or in areas where it might be washed away by floods. Timber within the area to be cleared shall become the property of the Contractor, and the Contractor may cut, trim, hew, saw, or otherwise dress felled timber within the limits of the Owner's property, provided timber and waste material is disposed of in a satisfactory manner. Materials shall be removed from the site daily, unless permission is granted by the Owner to store the materials for longer periods.

END OF SECTION

Part 1 General

1.1 Scope

- A. This Section includes earthwork and related operations, including, but not limited to, clearing and grubbing the construction site, dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures and pipe, backfilling all trenches and pits, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the work.
- B. The Contractor shall provide all services, labor, materials and equipment required for all earthwork and related operations necessary or convenient to the Contractor for furnishing complete work as shown on the Drawings or specified in these Contract Documents.

1.2 General

- A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonably accurate information about the existing elevations. They are not precise and the Contractor shall become satisfied as to the exact quantities of excavation and fill required.
- B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.
- C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels 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.
- D. Earthwork 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.
- E. The Contractor shall control grading in a manner to prevent surface water from 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.

- F. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition or condition thereof.
- G. Tests for compaction and density shall be conducted by an independent testing laboratory selected by the Owner. Payment for soil testing shall be made by the Contractor from the "Soils and Concrete Testing" Cash Allowance. 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, and shall be conducted in a manner acceptable to the Engineer.
- I. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. The Contractor shall be responsible for providing all services, labor, equipment and materials necessary or convenient to the Contractor for completing the work within the time specified in these Contract Documents.

Part 2 Products

2.1 Materials and Construction

- A. Earthwork Materials
 - 1. Fill Material, General
 - a. Approval Required: All fill material shall be subject to the approval of the Engineer.
 - b. Notification: For approval of imported fill material, notify the Engineer at least one week in advance of intention to import material, designate the proposed borrow area and permit the Engineer to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.
 - 2. On-Site Fill Material: All on-site fill material shall be soil exclusive of organic matter, frozen lumps or other deleterious substances. On-site fill material shall contain no rocks or lumps over 3-inches maximum in dimension.
 - 3. Imported Fill Materials: All imported fill material shall meet the requirements of on-site fill material.

4. Sand Cushions and Sand Fill: Sand cushions and sand fill shall consist of a sand-gravel fill of such gradation that 100 percent will pass a 3/8-inch sieve and not more than 10 percent by weight is lost by washing.
5. Coarse Aggregate: Coarse aggregate shall conform to the Georgia Department of Transportation Standard Specifications for Construction of Road and Bridges, 800.01 for No. 57 Stone, Group II.
6. Fine Aggregate: All fine aggregate shall conform to the Georgia Department of Transportation Standard Specifications for Construction of Road and Bridges, 801.01 and shall have the following gradation:

Sieve Size	Percent Passing
No. 4	100
No. 16	25 - 75
No. 100	0 - 25

7. Pea Gravel: Pea gravel shall be clean, naturally rounded aggregate, 1/8 to 3/4-inch in diameter per ASTM C 33.
 8. Top Soil: Dark organic weed free loam, free of muck.
- B. Sheeting, Bracing and Timbering: The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures or utilities outside of the trench or pit.

1. General

- a. Cofferdams and bracing design, including computations, shall be prepared before commencing construction operations. Drawings and design computations shall be signed and sealed by a professional engineer registered in the State which the work is performed. The Drawings and design computations shall not be submitted to the Engineer.
- b. Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Drawings and as ordered by the Engineer.
- c. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety.
- d. All sheeting in contact with the concrete or masonry shall be cut off as directed by the Engineer and left in place.

2. Timber: Timber may be substituted for steel sheet piling when approved by the Engineer. Timber for shoring, sheeting or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations.
 3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and/or live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Steel piling within three feet of an existing building, structure or pipeline shall remain in place, unless otherwise directed by the Engineer.
 4. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the structures and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.
- C. Other Materials: All other materials not specifically described but required for proper completion of the work of this Section shall be as selected by the Contractor subject to the approval of the Engineer.
- D. Stockpile Area: The stockpile area as directed by the Engineer shall be used to stockpile soil material for backfilling around structures and to stockpile needed topsoil.

Part 3 Execution

3.1 General

- A. Safety: Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Occupational Safety and Health Act and all other applicable safety regulations.
- B. Topsoil
1. Remove all topsoil to a depth at which subsoil is encountered, from all areas under buildings, pavements, and from all areas which are to be cut to lower grades or filled.
 2. With the Engineer's approval, topsoil to be used for finish grading may be stored on the site.
 3. Other topsoil may be used for fill in non-critical areas with approval of the Engineer.

4. Properly dispose of all excess topsoil off site at no additional cost to the Owner.

C. Bracing and Sheeting

1. Furnish, put in place, and maintain all sheeting, bracing and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the work, adjacent property or workers.
2. Properly support all excavations in locations indicated on the Drawings and where necessary to conform to all pertinent rules and regulations and these Specifications, even though such locations are not indicated on the Drawings.
3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.
4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved by the Engineer.

D. Obstructions

1. Remove and dispose of all trees, stumps, roots, boulders, sidewalks, driveways, pavement, pipes and the like, as required for the performance of the work.
2. Exercise care in excavating around catch basins, inlets and manholes so as not to disturb or damage these structures.
3. Avoid removing or loosening castings or pushing dirt into catch basins, inlets and manholes.
4. Damaged or displaced structures or casting shall be repaired, replaced and dirt entering the structures during the performance of the work shall be removed at no additional cost to the Owner.

- E. Extra Earth Excavation: In case soft or excessively wet material which, in the opinion of the Engineer, is not suitable is encountered below the final subgrade elevation of an excavation or underneath a structure, the Engineer may order the removal of this material and its replacement with crushed stone or other suitable material in order to make a suitable foundation for the construction of the structure.

F. Cutting Paved Surfaces and Similar Improvements

1. Remove existing pavement as necessary for installing pipe utilities and appurtenances or as otherwise shown on the Drawings.
2. Before removing any pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.

3. Break asphalt pavement along the marks using jack hammers or other suitable tools. Break concrete pavement along the marks by use of jack hammers or by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
4. Do not pull pavement with machines until completely broken and separated from pavement to remain.
5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. No additional payment will be made for removing and replacing damaged adjacent pavement.
6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
7. The Contractor may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.2 Excavation

A. Method

1. All excavation shall be by open cut from the surface except as indicated on the Drawings and noted in Section 01 35 00 of these Specifications.
2. All excavations for pipe appurtenances and structures shall be made in such manner and to such depth and width as will give ample room for building the structures and for bracing, sheeting and supporting the sides of the excavation, for pumping and draining groundwater and wastewater which may be encountered, and for the removal from the excavation of all materials excavated.
3. Take special care so that the soil below the bottom of the structure to be built is left undisturbed.

B. Grades

1. Excavate to grades indicated on the Drawings.
2. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.

C. Disposal of Excavated Material

1. Remove and properly dispose of all excavated material not needed to complete filling, backfilling and grading.
2. Dispose of excavated material off site at locations secured by the Contractor and in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of

water, or on any street or alley. No debris shall be deposited on any private property except by written consent of the property owner. In no case shall any material be left on the Project, shoved onto abutting private properties, or be buried in embankments or trenches on the Project.

3.3 Excavating for Structures

A. Earth Excavation

1. Earth excavation shall include all substances to be excavated other than rock. Earth excavation for structures shall be to limits not less than two feet outside wall lines, to allow for formwork and inspection, and further as necessary to permit the trades to install their work. All materials loosened or disturbed by excavation shall be removed from surfaces to receive concrete or crushed stone.
2. No separate payment will be made for earth excavation. The cost of such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.

B. Rock Excavation

1. Definition of Rock: Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (comparable to Caterpillar D 8K or comparable to Caterpillar 977 front-end loader, and occupying an original volume of at least one cubic yard). The Engineer shall be the sole determinant as to the limits to which the material is classified as rock.
2. Excavation: Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the Drawings or as otherwise directed by the Engineer. The Contractor shall be responsible for obtaining any blasting permits required.
3. Blasting: Blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The blasting shall be done by licensed experienced workers. Dispose of excavated rock in accordance with applicable federal, state, county and local regulations.
 - a. If, in the sole opinion of the Engineer, the Contractor persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the Engineer will direct the Contractor to employ an independent, qualified blasting consultant, approved by the Engineer, to supervise the preparation for each blast and approve the quantity of each charge. The cost of the blasting consultant will be paid for by the Contractor.
 - b. The Contractor will notify the Inspector before any charge is set and prior to blasting. Following review by the inspector regarding the proximity (normally within 300 linear feet) of permanent structures to the blasting site, the Engineer may direct the Contractor to employ an

- independent qualified specialty subcontractor, approved by the Engineer, to monitor the blasting by use of seismograph, identify areas where light charges must be used, conduct pre-event and post-event inspections of all structures, including photographs or videos, and maintain a detailed written log.
- c. Any damage done shall be promptly repaired by the Contractor at the Contractor's own expense.
 - d. Rock excavation will be paid for as an extra in addition to payment for earth excavation provided for elsewhere in these Specifications. Payment will be made for measured quantity of rock excavated, at the unit price bid per cubic yard. The unit price for rock excavation shall include the cost of rock excavation, the cost of handling sufficient and suitable fill material and all costs incidental thereto. The allowable volume of rock excavation for payment, unless otherwise authorized by the Engineer, shall be based on the following measurements:
 - 1) Horizontal measurement shall be to the actual dimension of the excavation, but not exceeding one foot in the clear outside the outer surface of the structure or a minimum of two feet from a wall.
 - 2) Depth measurement shall be made from the original top of rock to the bottom of the structure as constructed, or to the bottom of the rock, if above grade.
4. No allowance shall be made for overcutting or for excavation below the required elevations. The Engineer must be given reasonable notice to measure all rock.
 5. If excess excavation is made or the material becomes disturbed so as to require removal below final subgrade elevations or beyond the prescribed limits, the resulting space shall be refilled with Class "C" concrete in accordance with Section 31 23 33 of these Specifications.
- C. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock or compacted materials to insure proper bearing.
1. Unsuitable Foundation Material
 - a. Any material in the opinion of the Engineer which is unsuitable for foundation shall be removed and replaced with compacted crushed stone, or with compacted fill material as directed by the Engineer. Crushed stone shall meet the requirements of the Georgia Department of Transportation Specification 800.01 for No. 57 stone.
 - b. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.
 2. Foundation in Rock

- a. Foundations for a structure shall be on similar materials. Should excavation for a foundation be partially in rock, the Contractor shall undercut that portion of the rock 12-inches and bring the excavation to grade with compacted crushed stone.
- b. Where ordered by the Engineer, undercutting of rock and replacement with crushed stone will be paid for at the unit price bid for rock excavation. The quantity shall equal one foot of depth over the horizontal dimensions authorized by the Engineer.

3. Pipe Trenches Beneath Structures

- a. Where piping or conduit passes beneath footings or slabs resting on grade, trenches shall be excavated to provide a minimum of 6-inches clearance from all surfaces of the pipe or conduit. The trench shall be backfilled to the base of the structure with concrete.
- b. No separate payment will be made for concrete backfill of trenches beneath structures. The cost of this work and all costs incidental to it shall be included in the price bid for the item to which the work pertains.

4. Unauthorized Excavation

- a. Care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth or rock. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings and compacted crushed stone or other approved material under slabs. Crushed stone or gravel shall meet the Georgia Department of Transportation Specification 800.01 for No. 57 stone. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete, or formwork shall be provided, as directed by the Engineer.
- b. Additional costs of corrective work, made necessary by unauthorized excavation of earth or rock, shall be borne by the Contractor.

D. Unsuitable Bearing

1. If suitable bearings for foundations are not encountered at the elevations indicated on the Drawings, immediately notify the Engineer.
2. Do not proceed further until instructions are received and necessary measurements made for purposes of establishing additional volume of excavation.

3.4 Fill

A. Controlled Fill

1. The fill for roadways, parking areas, walks, structures, and building slabs on grade shall be controlled fill.
2. After the existing ground or excavated area has been proofrolled and examined by the Engineer, all holes and other irregularities shall be filled and compacted before the main fill is placed.
3. The fill shall be placed in even layers not exceeding 10-inches in depth and shall be thoroughly compacted as herein specified.
4. If an analysis of the soil being placed shows a marked difference from one location to another, the fill being placed shall not be made up of a mixture of these materials.
5. Each different type of material shall be handled continuously so that field control of moisture and density may be based upon a known type of material.
6. No fill shall be placed following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.

B. Proofrolling

1. All areas where roadways, parking areas, sidewalks, structures, and buildings are to be constructed on cut areas, compacted fill, and other areas where indicated on the Drawings, shall be proofrolled to detect soft spots prior to the placement of fill material and after placement of fill, which shall be construction of foundations.
2. Proofrolling shall consist of moving a 20-30 ton loaded dump truck or other pneumatic tire roller over the subgrade before the subgrade is shaped. Proofrolling shall be witnessed by the Engineer.
3. Pneumatic-tired rollers shall have not fewer than four pneumatic tired wheels which shall be of such size and ply that tire pressures can be maintained between 80 and 100 pounds per square inch for 25,000 pound wheel load during rolling operations. Unless otherwise required, rolling shall be done with tires inflated to 90 psi. The roller wheels shall be located abreast in a rigid steel frame. Each wheel shall be loaded with an individual weight box so that each wheel will bear an equal load when traversing uneven ground. The weight boxes shall be suitable for ballast loading such that the load per wheel shall be 25,000 pounds. The spacing of the wheels shall insure that the distance between the nearest edges of adjacent tires shall be not greater than one-half of the tire width of a single tire at the operating pressure for a 25,000 pound wheel load. The roller shall be operated no faster than 10 miles per hour.
4. Subgrade shall be proofrolled with six passes of the truck or roller. Depressions that develop during the proofrolling operation shall be filled with suitable material and those filled areas shall be proofrolled with six passes of the roller. If, after having been filled and proofrolled, the subgrade still contains depressions, the

area shall be undercut to the full depth of the soft material or five feet whichever is less, backfilled, recompact, and rolled to achieve a subgrade acceptable to the Engineer.

5. After the proofrolled subgrade has been accepted by the Engineer, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 1/4-inch at every point.
6. Conduits, pipes, culverts and underdrains shall be neither disturbed nor damaged by proofrolling operations. Rollers shall neither pass over, nor approach closer than five feet to, conduits, pipes, culverts and underdrains unless the tops of those products are deeper than three feet.

C. Placement

1. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed as described under Article 3.2. The area shall then be scarified to a depth of at least 6-inches.
2. Fill materials shall be placed in continuous approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practical and having a net compacted thickness of not over 6-inches.
3. Fill materials shall be placed at optimum moisture content within practicable limits (not less than one percent below optimum). Optimum moisture shall be maintained by sprinkling the layers as placed or by allowing materials to dry before placement.

D. Compaction

1. Fill materials shall be compacted to dry densities as determined by the Standard Proctor Compaction Test performed in accordance with ASTM D 698.
2. Fill materials supporting roadways, parking areas, sidewalks, structures, and buildings, and backfill around structures, buildings, and walls shall be compacted to 95 percent of the maximum dry density. The top 12-inches of fill material supporting roadways, parking areas, sidewalks, structures, and buildings shall be compacted to 98 percent of the maximum dry density. Fill placed for general site grading shall be compacted to 90 percent of the maximum dry density.
3. Compaction of embankments shall be by sheepfoot rollers with staggered, uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend beyond the final contours sufficiently to insure compaction of the material at the

resulting final surface. Final contours shall then be achieved by a tracked bulldozer shaping the face of the embankment.

4. Compaction of backfill around structures shall be accomplished by heavy power tamping equipment.
 5. If tests indicate that density of fill is less than that specified, the area shall be either recompacted or undercut, filled, and compacted until specified density is achieved.
- E. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain.
- F. Excess Material
1. Any excess earth excavation and unsuitable materials shall be placed on the site as directed by the Engineer. Surfaces and slopes of waste fills shall be left smooth and free to drain.
 2. No separate payment will be made for backfilling. The cost of all such work and all costs incidental thereto shall be included in the price bid for the item to which the work pertains.
- G. Moisture
1. All fill shall be compacted with the moisture content as established by the 98 percent intercept on the moisture density curves or the moisture content at the shrinkage limit, whichever is less.
 2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.
 3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

3.5 Backfilling

- A. Backfill carefully to restore the ground surface to its original condition. Dispose of surplus material.
- B. Compact backfill underlying roadways, parking areas, sidewalks, structures, and buildings to 95 percent of the maximum dry density.
- C. Backfill for Pipe: Refer to Section 31 23 33 - Trenching and Backfilling of these Specifications.
- D. Backfilling Around Structures

1. General

- a. Remove debris from excavations before backfilling.
- b. Do not backfill against foundation walls until so directed by the Engineer nor until all indicated perimeter insulation and/or waterproofing is in place.
- c. Protect such insulation and/or waterproofing during filling operations.
- d. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.
- e. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.
- f. Backfilling against walls is to take place after all the concrete in the affected members has attained the specified strengths.

2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

3.6 Grading

- A. General: Perform all rough and finish grading required to attain the elevations indicated on the Drawings. Perform finish grading to an accuracy of + 0.10 foot.
- B. Compact backfill underlying roadways, parking areas, sidewalks, structures and buildings to 95 percent of the maximum dry density. The top 12-inches of backfill shall be compacted to 98 percent of the maximum dry density.
 1. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.
- C. Treatment After Completion of Grading
 1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the Engineer.
 2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.7 Surface Water Control

- A. Regulations and Permits: Obtain all necessary soil erosion control permits in accordance with all pertinent rules, laws, and regulations of all applicable federal, state, county and municipal regulatory agencies.

B. Unfavorable Weather

1. Do not place, spread or roll any fill material during unfavorable weather conditions.
2. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.

C. Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collected in depressions.

D. Pumping and Drainage

1. Provide, maintain and use at all times during construction adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the work.
2. Dewater by means which will insure dry excavations, preserve final lines and grades, do not disturb or displace adjacent soil.
3. All pumping and drainage shall be done with no damage to property or structures and without interference with the rights of the public, owners of private property, pedestrians, vehicular traffic or the work of other contractors, and in accordance with all pertinent laws, ordinances and regulations.
4. Do not overload or obstruct existing drainage facilities.

3.8 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.

3.9 Cleaning

- A. Upon completion of the work of this Section, remove all rubbish, trash and debris resulting from construction operations. Remove surplus equipment and tools. Leave the site in a neat and orderly condition acceptable to the Engineer, and in conformance with Section 01 74 00 of these Specifications.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Section includes construction dewatering. Contractor shall be responsible for dewatering system during construction.

1.2 Related Sections:

- 1. Section 31 11 00 – Clearing and Grubbing
- 2. Section 31 20 00 – Earth Moving

1.3 Submittals

- A. Submit work plan in accordance with Section 01 33 00 – Submittal Requirements.
- B. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
 - 3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
 - 4. Include written plan for dewatering operations including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.
- C. Qualification Data: For installer.
- D. Field quality-control reports.
- E. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.
- F. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.4 Quality Assurance

- A. Installer Qualifications: An experienced installer that has specialized in dewatering work.

1.5 Field Conditions

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
1. Make additional test borings and conduct other exploratory operations necessary for dewatering according to the performance requirements.

Part 2 Products

2.1 Performance Requirements

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
 2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 3. Prevent surface water from entering excavations by grading, dikes, or other means.
 4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 5. Remove dewatering system when no longer required for construction unless otherwise instructed by Owner/Engineer.
 6. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

Part 3 Execution

3.1 Preparation

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.

1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Provide temporary grading to facilitate dewatering and control of surface water.
- D. Protect and maintain temporary erosion and sedimentation controls, which are specified in other applicable sections of these specifications, during dewatering operations.

3.2 Installation

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
1. Space well points or wells at intervals required to provide sufficient dewatering.
 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 Operation

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.

Dewatering

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.
- C. Dispose of water and sediment removed in conformance with Section 01 57 23 – Temporary Stormwater Pollution Control. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.
- D. Remove dewatering system from Project site on completion of dewatering if required. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 Field Quality Control

- A. Observation Wells: Provide observation wells or piezometers, take measurements, and maintain at least the minimum number indicated; additional observation wells may be required by authorities having jurisdiction.
1. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
 2. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. In areas where observation wells are not functioning properly, suspend construction activities until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
 3. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.
- B. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.
- C. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.
- D. Prepare reports of observations.

3.5 Protection

- A. Protect and maintain dewatering system during dewatering operations.

- B. Promptly repair damages to adjacent facilities caused by dewatering.
 - 1. Dispose of strippings that are unsuitable for topsoil or that exceed quantity required for topsoil offsite.
 - 2. Stockpile topsoil in sufficient quantity to meet Project needs. Dispose of excess strippings as specified for clearing and grubbing.

END OF SECTION

Part 1 General

1.1 Scope

- A. The work under this Section consists of furnishing all labor, equipment and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines shown on the Drawings and as specified.
- B. Excavation shall include the removal of any trees, stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the Drawings and as specified.
- C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.
- D. The trench is divided into five specific areas:
 - 1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization.
 - 2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.
 - 3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.
 - 4. Initial Backfill: The area above the haunching material and below a plane 18-inches above the top of the barrel of the pipe.
 - 5. Final Backfill: The area above a plane 18-inches above the top of the barrel of the pipe.
- E. The choice of method, means, techniques and equipment rests with the Contractor. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of manmade improvements to be protected, available easement or right-of-way and prevailing practice in the area.

1.2 References

- A. Georgia Department of Transportation (GDOT)
 - 1. GDOT Standards Specifications
- B. ASTM International (ASTM)

1. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 2. ASTM C94 - Standard Specification for Ready-Mixed Concrete
 3. ASTM D1556 - Density and Unit Weight of Soil in Place by the Sand-Cone Method
 4. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 5. ASTM D2937 - Standard Test Method for Density of Soil in Place by the Drive Cylinder Method
 6. ASTM D3786 - Standard Test Method for Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method
 7. ASTM D3787 - Standard Test Method for Bursting Strength of Textiles Constant Rate of Traverse (CRT) Ball Burst Test
 8. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
 9. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
 10. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 11. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft.)
- C. United Soil Classification System (USCS)

1.3 Quality Assurance

- A. Density: All references to “maximum dry density” shall mean the maximum dry density defined by the “Maximum Density-Optimum Moisture Test”, ASTM D 698, except that for non-cohesive materials “maximum dry density” shall mean the maximum index density as determined by ASTM D 4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, ASTM D 2937, or ASTM D 2922.
- B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory in accordance with Section 01 45 29 of these Specifications. All imported fill materials shall meet the requirements of on-site fill materials.

1.4 Safety

- A. A "Qualified Person", as defined by OSHA regulations, shall be on-site at all times during activities requiring trench safety provisions.
- B. Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act (OSHA) of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA Publication 2226.

Part 2 Products

2.1 Trench Foundation Materials

- A. Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.2 Bedding and Haunching Materials

- A. Unless specified otherwise, bedding and haunching materials shall be earth materials as specified below.
- B. Crushed stone utilized for bedding and haunching shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be No. 57.
- C. Earth materials utilized for bedding and haunching shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as bedding or haunching material, provide select material conforming to the requirements of this Section.
- D. Filter Fabric
 - 1. Filter fabric associated with bedding shall be a polypropylene woven fabric. The fabric shall be a high modulus type with good separation capabilities. The fabric shall be inert to biological degradation and naturally occurring chemicals, alkalis and acids.

2. The fabric shall have an equivalent opening size (EOS or AOS) of 20 to 45. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Method	Minimum Value
Grab Tensile Strength	lbs.	ASTM D 4632	200
Grab Tensile Elongation	%	ASTM D 4632	30 (max.)
Mullen Burst Strength	psi	ASTM D 3786	400
Trapezoid Tear Strength	lbs.	ASTM D 4533	75
Puncture Strength	lbs.	ASTM D 3787	75

3. Filter fabric shall be Mirafi 500X, Amoco 2002 or Exxon GTF-200.

2.3 Initial Backfill

- A. Initial backfill material shall be crushed stone or earth materials as specified for bedding and haunching materials.
- B. Earth materials utilized for initial backfill shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, initial backfill materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as initial backfill material, provide select material conforming to the requirements of this Section.

2.4 Final Backfill

- A. Final backfill material shall be general excavated earth materials, shall not contain more than one-third broken rock, of which no stone or boulder shall weigh more than 50 pounds, cinders, stumps, limbs, man-made wastes and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

2.5 Select Backfill

- A. Select backfill shall be materials which meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

- B. Earth materials suitable for use as bedding and haunching, initial backfill, and final backfill shall be classified according to the United Soil Classification System (USCS) as GM, GC, GW, GP, SM, SC, SW, SP, ML, or CL, provided they also comply with all other requirements of the Specifications. Combinations of permissible USCS soil types are also permitted provided they comply with other requirements of the Specifications. Soil types with USCS classifications of OH, OL, or PT are not acceptable for use in backfill and may not be mixed with other soil types and used as backfill. Soil types with USCS classifications of CH or MH are not suitable, but these soil types may be mixed with other soil so that the classification of the mixed soil falls into an acceptable classification.

2.6 Concrete

- A. Concrete for bedding, haunching, initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

Part 3 Execution

3.1 Trench Excavation

- A. Topsoil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.
- B. Trenches shall be excavated to the lines and grades shown on the Drawings with the centerlines of the trenches on the centerlines of the pipes and to the dimensions which provide the proper support and protection of the pipe and other structures and accessories.
- C. Trench Width for Pipelines
 1. The sides of all trenches shall be vertical to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.
 2. Excavate the top portion of the trench to any width within the construction easement or right-of-way which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.
 3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 9-inches clearance between the rock and any part of the pipe barrel, manhole, vault or other sewer or sewer main appurtenance.

4. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the next higher Class or Type of bedding and haunching as shown on the Drawings for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the Contractor's tamping and compaction equipment, intentional over-excavation due to the size of the Contractor's excavation equipment, or other reasons beyond the control of the Engineer or Owner.

D. Depth

1. The trenches shall be excavated to the required depth or elevation which allow for the placement of the pipe and bedding to the dimensions shown on the Drawings.
2. Force Mains
 - a. Depth of Trenches: Excavate trenches to provide depths as shown on the Drawings. The depth of cover shall not exceed that as shown on the Drawings by more than two feet, without approval of the Engineer.
 - b. Increase the depth of cover where specifically shown on the Drawings and where necessary to avoid interference with underground utilities and obstructions.
3. Where rock is encountered in trenches for pipelines, excavate to the minimum depth which will provide clearance below the pipe barrel of 8-inches for pipe 21-inches in diameter and smaller and 12-inches for larger pipe, valves, manholes and vaults. Remove boulders and stones to provide a minimum of 6-inches clearance between the rock and any part of the pipe, manhole or accessory.

E. Excavated Materials

1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.
2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.2 Sheeting, Bracing and Shoring

- A. Sheeting, bracing and shoring shall be performed in the following instances:

1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.
 2. In caving ground.
 3. In wet, saturated, flowing or otherwise unstable materials. The sides of all trenches and excavations shall be adequately sheeted, braced and shored.
 4. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees or private properties which are required to remain.
 5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.
- B. In all cases, excavation protection shall strictly conform to the requirements of the OSHA of 1970, as amended.
- C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.
- D. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities.
- E. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe or utility.
- F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed or is within three feet of an existing structure, utility, or pipeline. Cut off any sheeting left in place at least two feet below the surface.
- G. Sheet piling within three feet of an existing structure or pipeline shall remain in place, unless otherwise directed by the Engineer.

3.3 Rock Excavation

- A. Definition of Rock: Any material which cannot be excavated with conventional excavating equipment, and is removed by drilling and blasting, and occupies an original volume of at least one-half cubic yard.
- B. Blasting: Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the Engineer may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge. No separate payment will be made by Owner for employment of such independent blasting consultant.
- C. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.
- D. The Contractor shall notify the Owner prior to any blasting. Additionally, the Contractor shall notify the Owner before any charge is set.

3.4 Dewatering Excavations

- A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench, unless directed otherwise by the Owner or specified in Section 01 35 00 of these Specifications.
- B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.
- C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the utility crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.
- D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling. Trench water shall be discharged through a filter bag or sedimentation basin as necessary to prevent escape of sediment from the site.
- E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.

- F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the trench bottom. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing, 6 to 10-inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

3.5 Trench Foundation and Stabilization

- A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.
- B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and the Owner shall then authorize payment for trench stabilization.
- C. Should the undisturbed material encountered at the trench bottom constitute, in the opinion of the Owner, an unstable foundation for the pipe, the Contractor shall be required to remove such unstable material and fill the trench to the proper subgrade with crushed stone as directed by the Owner.
- D. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.
- E. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

3.6 Bedding and Haunching

- A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.
- B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.

- C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.
- D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.
- E. Manholes: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole. Place and compact crushed stone bedding material to the required grade before constructing the manhole.
- F. Force Mains
 - 1. Ductile Iron Pipe
 - a. Unless otherwise shown on the Drawings or specified, utilize earth materials for bedding and haunching. Type 2, 3, 4 and 5 bedding shall be as detailed on the Drawings.
 - b. Unless specified or shown otherwise, bedding shall meet the requirements for Type 2 Pipe Bedding. Unless specified or shown otherwise for restrained joint pipe and fittings, bedding shall meet the requirements of Type 3 Pipe Bedding.
 - c. Where the depth of cover, for 20-inch force main, over the piping exceeds 11 feet, the pipe bedding shall meet the requirements of Type 3 Pipe Bedding.
- G. Excessive Width and Depth
 - 1. Gravity Sewers: If the trench is excavated to excess width, provide the bedding class with the next higher bedding factor. Crushed stone haunching and initial backfill may be used in lieu of Class "A" bedding, where Class "A" bedding is necessitated by excessive trench width.
 - 2. Force Mains: If the trench is excavated to excess width, provide the next higher type or class of pipe bedding, but a minimum of Type 4, as detailed on the Drawings.
 - 3. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.
- H. Compaction
 - 1. Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of 90 percent of the maximum dry density, unless shown or specified otherwise.

3.7 Initial Backfill

- A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.
- B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least 18-inches above the pipe barrel. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.
- C. Backfill on both sides of the pipe simultaneously to prevent side pressures.
- D. Compact each layer thoroughly with suitable hand tools or tamping equipment.
- E. Initial backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless shown or specified otherwise.
- F. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

3.8 Final Backfill

- A. Backfill carefully to restore the ground surface to its original condition.
- B. The top 6-inches shall be topsoil obtained as specified in "Trench Excavation" of this Section.
- C. Excavated material which is unsuitable for backfilling, and excess material, shall be disposed of, at no additional cost to the Owner, in a manner approved by the Owner. Surplus soil may be neatly distributed and spread over the site, if approved by the Owner. If such spreading is allowed, the site shall be left in a clean and slightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.
- D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this section.
- E. After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:
 - 1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack".
 - 2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet.
 - 3. In 24-inch layers, if using a hydra-hammer.

- F. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.
- G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless specified otherwise.

3.9 Backfill Under Roads

- A. Compact backfill underlying dirt and gravel roads and sidewalks to a minimum 95 percent of the maximum dry density. The top 12-inches shall be compacted to a minimum of 98 percent of the maximum dry density. Compact backfill underlying pavement to that shown on the Drawings for asphalt replacement.

3.10 Detection Tape

- A. Where required, detection tape shall be buried 4 to 10-inches beneath the ground surface directly over the top of the pipe. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20-inches from the finished grade surface.

3.11 Testing and Inspection

- A. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with Article 1.3 of this section.
 - 2. Field density tests for each two feet of lift, one test for each 1,000 feet of pipe installed or more frequently if ordered by the Engineer.
 - 3. Inspecting and testing stripped site, subgrades and proposed fill materials.
- B. The Contractor's duties relative to testing include:
 - 1. Notifying laboratory of conditions requiring testing.
 - 2. Coordinating with laboratory for field testing.
 - 3. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.
 - 4. Providing excavation as necessary for laboratory personnel to conduct tests.
- C. Inspection
 - 1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the Owner.

2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer, who shall verify suitable bearing and construction.
- D. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

END OF SECTION

Part 1 General

1.1 Scope

- A. The work to be performed under this section shall consist of removing and replacing existing pavement, curb and gutter, sidewalks, and driveways where such have been removed for construction of water mains and all other water appurtenances and structures.

1.2 Submittals

- A. Certificates: Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.
- B. Traffic paint manufacturer's application instructions and a description and other data relative to the Contractor's application equipment and methods shall be submitted to the Engineer for approval.

1.3 Conditions

- A. Weather Limitations
 - 1. Apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least 50 degrees F for 12 hours immediately prior to application.
 - 2. Do not conduct paving operations when surface is wet or contains excess of moisture which would prevent uniform distribution and required penetration.
 - 3. Construct asphaltic courses only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
 - 4. Place base course when air temperature is above 35 degrees F and rising.
- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

Part 2 Products

2.1 Materials and Construction

- A. Graded Aggregate Base Course: Graded aggregate base course shall be of uniform quality throughout and shall meet the requirements of Section 815.01 of the Georgia Department of Transportation Standard Specifications.

- B. **Surface Course:** The surface course for all pavement, including prime or tack coat when required by the Engineer, shall conform to the requirements of Section 400, 12.5 mm Superpave of the Georgia Department of Transportation Standard Specifications.
- C. **Concrete:** Provide concrete and reinforcing for concrete pavement or base courses in accordance with the requirements of the Georgia Department of Transportation Standard Specifications, Section 430.
- D. **Special Surfaces:** Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g., brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

2.2 Types of Pavements

- A. **General:** All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existing prior to construction, unless otherwise directed by the Engineer. Materials, equipment and construction methods used for paving work shall conform to the Georgia Department of Transportation specifications applicable to the particular type required for replacement, repair or new pavements.
- B. **Aggregate Base:** Aggregate base shall be constructed in accordance with the requirements of Section 310 of the Georgia Department of Transportation Standard Specifications. The maximum thickness to be laid in a single course shall be 6-inches compacted. If the design thickness of the base is more than 6-inches, it shall be constructed in two or more courses of approximate equal thickness. After the material placed has been shaped to line, grade and cross-section, it shall be rolled until the course has been uniformly compacted to at least 100 percent of the maximum dry density when Group 2 aggregate is used, or to at least 98 percent of maximum dry density when Group 1 aggregate is used.
- C. **Concrete Pavement:** Concrete pavement or base courses shall be replaced with concrete. The surface finish of the replaced concrete pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the same types and dimensions as those removed. Concrete pavements or concrete base courses shall be reinforced.
- D. **Asphaltic Concrete Base, Binder and Surface Course:** Asphaltic concrete base, binder and surface course construction shall conform to Georgia Department of Transportation Standard Specifications, Section 400. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry and the tack coat has been applied.

Apply and compact the base in maximum layer thickness by asphalt spreader equipment of design and operation approved by the Engineer. After compaction, the black base shall be smooth and true to established profiles and sections. Apply and compact binder and the surface course in a manner approved by the Engineer. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

- E. Surface Treatment Pavement: Bituminous penetration surface treatment pavement shall be replaced with a minimum thickness of 1-inch conforming to Section 424, Georgia Department of Transportation Standard Specifications.
- F. Temporary Measures: During the time period between pavement removal and complete replacement of permanent pavement, maintain highways, streets and roadways by the use of steel running plates anchored to prevent movement. The backfill above the pipe shall be compacted, as specified in Section 31 23 33 of these Specifications, up to the existing pavement surface to provide support for the steel running plates. All pavement shall be replaced within seven calendar days of its removal.

Part 3 Execution

3.1 Removing Pavement

- A. General: Remove existing pavement as necessary for installing the pipe line and appurtenances.
- B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench.
- C. Breaking: Break asphalt pavement along the marks using pavement shearing equipment, jack hammers or other suitable tools. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
- D. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.
- E. Where milling is shown to be performed as a method of pavement removal, milling shall be performed to the depth and width of which pavement resurfacing is required as shown on the Drawings. The widths shown are minimum dimensions and the Contractor may elect to mill at a wider dimension to suit the equipment. If milling is performed at a wider dimension than shown, resurfacing courses shall be installed to account for the additional pavement removed.
- F. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

- G. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
- H. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.2 Replacing Pavement

- A. Preparation of Subgrade: Upon completion of backfilling and compaction of the backfill, arrange to have the compaction tested by an independent testing laboratory approved by the Engineer. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.
 - 1. The existing street pavement or surface shall be removed along the lines of the work for the allowable width specified for the trench or structure. After the installation of the sewerage or water works facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed, as shown on the Drawings, or as specified elsewhere in this Section of these Specifications shall be done immediately prior to replacing the pavement.
 - 2. Trench backfill shall be compacted for the full depth of the trench as specified in Section 31 23 33 of these Specifications.
 - 3. Temporary trench backfill along streets and driveways shall include 6-inches of crushed stone or cherty clay as a temporary surfacing of the trenches. This temporary surface shall be maintained carefully at grade and dust-free by the Contractor until the backfill of the trench has thoroughly compacted in the opinion of the Engineer and permission is granted to replace the street pavement.
 - 4. When temporary crushed stone or chert surface is considered by the Engineer to be sufficient surface for gravel pavement, the surface shall be graded smooth and to an elevation that will make the final permanent surfacing level with the adjacent surfacing that was undisturbed.
- B. Pavement Replacement
 - 1. Prior to replacing pavement, make a final cut in concrete pavement a minimum of the distance from the edge of the trench as indicated on the Drawings and no less than 6-inches back from the edge of the damaged pavement with a concrete saw. Remove asphalt pavement a minimum of the distance from the edge of the trench as indicated on the Drawings and no less than 6-inches back from the edge of the damaged pavement using pavement shearing equipment, jack hammers or other suitable tools.
 - 2. Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks and curbs with the same material, to nearest existing undisturbed construction joint and to the same dimensions as those existing.

3. If the temporary crushed stone or chert surface is to be replaced, the top 6-inches shall be removed and the crushed stone surfacing for unpaved streets or the base for the bituminous surface shall be placed.
 4. Following this preparation, the chert or crushed stone base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.
 5. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary chert or crushed stone surface and any necessary backfill material, additional existing paving and new excavation shall be removed to the depth and width shown on the Drawings. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and crushed stone bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.
 6. Where driveways or roadways, constructed of specialty type surfaces, e.g., brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.
- C. Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original unless directed otherwise by the Engineer.

3.3 Sidewalk and Curb and Gutter Replacement

A. Construction

1. All concrete sidewalks and curbs and gutters shall be replaced with concrete.
2. Preformed joints shall be 1/2-inch thick, conforming to the latest edition of AASHTO M59 for sidewalks and AASHTO M 123 for curbs.
3. Forms for sidewalks shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength, when in place, to hold the concrete true to line and grade without springing or distorting.
4. Forms for curbs shall be metal and of an approved section. They shall be straight and free from distortions, showing no vertical variation greater than 1/8-inch in 10 feet and no lateral variation greater than 1/4-inch in 10 feet from the true plane surface on the vertical face of the form. Forms shall be of the full depth of the structure and constructed such to permit the inside forms to be securely fastened to the outside forms.

5. Securely hold forms in place true to the lines and grades as required to match the existing sidewalks and curb and gutters.
 6. Wood forms may be used on sharp turns and for special sections, as approved by the Engineer. Where wooden forms are used, they shall be free from warp and shall be the nominal depth of the structure.
 7. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
- B. When a section is removed, the existing sidewalk or curb and gutters shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distance of five feet from the edge of the trench.
- C. Existing concrete sidewalks and curbs and gutters that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surface of the new work shall form an even, unbroken plane with the existing surfaces.
- D. The subgrade shall be formed by excavating to a depth equal to the thickness of the concrete, plus 2-inches. Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrades shall be compacted by hand tamping or rolling. Soft, yielding or unstable material shall be removed and backfilled with satisfactory material. Place 2-inches of porous crushed stone under all sidewalks and curbs and compact thoroughly, then finish to a smooth, unyielding surface at proper line, grade and cross section.
- E. Joint for Curbs
1. Joints shall be constructed as specified. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
 2. Thoroughly spade and compact the concrete at the faces of all joints filling all voids.
 3. Install expansion joint materials at the point of curve at all street returns. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
 4. Place contraction joints every 10 feet along the length of the curbs and gutters. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or they shall be notched to

permit the reinforcement to be continuous through the joint. Contraction joints shall be a minimum of 1-1/2-inches deep.

- F. Expansion joints shall be required to replace any removed expansion joints or in new construction wherever shown on the Drawings. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within 1/2-inch of the top of finished concrete surface.
- G. Finishing
 - 1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
 - 2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius which will match adjacent, existing curbs.
 - 3. Finish edges with an approved finishing tool having a 1/4-inch radius.
 - 4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
 - 5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.
- H. Driveway and Sidewalk Ramp Openings
 - 1. Provide driveway openings of the widths and at the locations to match existing indicated on the Drawings and or as directed by the Engineer.
 - 2. Provide sidewalk ramp openings where indicated on the Drawings, in conformance with the applicable regulations and as directed by the Engineer.
- I. Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured. Provide necessary barricades to protect the work. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor, at no additional expense to the Owner.

3.4 Maintenance

- A. The Contractor shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the Project. Maintenance shall include replacement, scraping, reshaping, wetting and rerolling as necessary to prevent raveling of the road material, the preservation of reasonably smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the Engineer. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

3.5 Supervision and Approval

- A. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.
- B. Obtain the Engineer's approval of restoration of pavement, such as private roads and drives, that are not the responsibility of a regulatory agency.
- C. Complete pavement restoration as soon as possible after backfilling.
- D. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.

3.6 Cleaning

- A. The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition.

END OF SECTION

Part 1 General

1.1 Scope

The work described in this Section includes furnishing all labor and equipment necessary for the construction and preparation of part or all of the road bed to receive the immediate construction of a base or pavement thereon.

Part 2 Products (Not Used)

Part 3 Execution

3.1 Equipment

All equipment necessary and required for the construction of the subgrade must be on the Project, proven to be in first-class working order and approved by the Engineer before construction will be permitted to begin. This shall consist of at least one motor grader with scarifier and one pneumatic tired roller meeting the requirements of the Georgia Department of Transportation Standard Specifications for Road and Bridge Construction.

3.2 Subgrade Preparation

- A. Road and drainage excavation and embankment construction shall be performed in accordance with the provisions of Section 31 20 00 of these Specifications.
- B. The subgrade shall be prepared to the lines and grades and correspond to the cross section of the bottom of the pavement as indicated on the Drawings or as directed.
- C. Where excavation is necessary to prepare the subgrade, the material removed shall be carefully stored or placed for use in completing the roadbed. Unsuitable material shall be wasted as directed by the Engineer.
- D. All rock shall be removed to a depth of not less than 6-inches below the surface of the subgrade and all holes or depressions, caused by the removal of rock, or otherwise, shall be backfilled with satisfactory material and thoroughly compacted.
- E. Where the roadbed is below grade, the Contractor shall prepare the subgrade by hauling and spreading satisfactory material excavated in channeling, or otherwise. The material shall be spread in layers not to exceed 6-inches in thickness and thoroughly compacted by rolling, using water if directed. Each layer shall have been completed before the succeeding layer is started.
- F. Where it is intended or required to use steel forms in the construction of the base of pavement, the subgrade shall be constructed at least 12-inches wider, on each side, than the net width of the base of pavement. For bases or pavements using wooden forms, the subgrade shall be constructed at least 6-inches wider, on each side, than the

Subgrade Construction and Preparation

width of the base or pavement, as indicated on the Drawings or as directed.

- G. Where subbases are to be constructed on the subgrade, the limits of the subgrade preparation shall extend across the entire section upon which any subbase course is to be applied, including the shoulders.
- H. When the subgrade is being prepared for the construction of a Portland cement concrete base or Portland cement concrete pavement it shall be formed to the approximate grade and cross section. The preparation of the subgrade shall be performed in conformity with the requirements set out in the section covering the particular type of construction.

3.3 Subgrade Compaction

- A. After the subgrade has been appropriately prepared and shaped, it shall be loosened in its entirety by disking, harrowing or other approved methods to a depth of not less than 6-inches prior to its being compacted to the approved density. The subgrade shall then be thoroughly compacted with the 10 ton roller or pneumatic tired roller. The density shall be 95 percent of maximum dry density when tested by the ASTM D1557 (latest revision). The limits of the subgrade compaction shall extend across the entire section upon which any base or subbase course is to be applied, including the shoulders. Prior to reworking and compacting the subgrade, all vegetation within the limits as set out above shall be removed and properly disposed of as directed by the Engineer.
- B. All soft, yielding material, which will not compact readily under the roller, shall be removed as directed. All holes or depressions caused by the removal of material, as described above, shall be backfilled with satisfactory material and the entire surface thoroughly compacted with the roller where possible, or otherwise when directed by the Engineer.
- C. The subgrade shall be checked after rolling and adjusted so as to conform to the grade and cross section, as indicated or directed.
- D. The final rolling of the subgrade, preparatory to the construction of the Portland cement concrete base or pavement thereon, shall be performed between the forms after they are finally set to line and grade.

3.4 Scope of Subgrade

The subgrade shall be true to lines, grades and cross sections, must be free from dust or other loose material, must have a uniform bearing power, and shall be prepared and maintained at least 500 feet in advance of the placing of any materials thereon, except between November 1 and April 1 the distance may be reduced to 200 feet if permitted by the Engineer.

3.5 Drainage

- A. Grading of the subgrade shall be performed in such a manner that there will not remain on the roadbed, at anytime, berms of earth or other material which will interfere with the immediate drainage of water from the subgrade of the side ditches. All side ditches and drains shall be maintained to provide for proper drainage during the construction.

- B. All ditches and drains shall be completed so as to drain the roadbed effectively before the placing of any construction materials will be permitted.

3.6 Protection of Subgrade

- A. In handling materials, equipment, tools, etc., the Contractor shall take all precaution necessary to protect the subgrade from damage. Only hauling necessary for the purpose of construction will be permitted on the subgrade after it has been completed.
- B. If ruts of 2-inches or more in depth are formed in the subgrade, all construction materials, whether stored or in place, within the range of such ruts, shall be removed and the subgrade shall be reshaped and rolled. All ruts or rough places developing in a completed subgrade shall be smoothed and the subgrade rerolled.

3.7 Subgrade Checking

- A. The subgrade must conform to the lines, grades and cross sections, indicated or directed, before it will be permitted to construct base or pavement thereon, and shall be subject to test just prior to construction.
- B. The subgrade for base or pavement requiring steel side forms will be checked by a special tester, as provided in the section covering this type of construction.
- C. All excess material shall be removed until the subgrade is at true elevation. Low subgrade shall be built up to the proper form and elevation when practical to roll, or if not practical to roll, it shall be filled as an integral part of the base or pavement at the Contractor's expense.

3.8 Cleaning

The disposal of excess or unsuitable material shall be performed in accordance with the requirements of Section 01 74 26 of these Specifications and final clean-up shall be performed in accordance with the requirements of Section 01 74 00 of these Specifications.

END OF SECTION

Part 1 General

1.1 Scope

The Contractor shall furnish all labor, materials, equipment and incidentals required to construct asphalt concrete pavements to the grades and cross-sections shown on the Drawings and as specified herein.

1.2 Quality Assurance

- A. Use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete.
- B. Comply with applicable requirements of Georgia Department of Transportation, Standard Specifications for Construction of Roads and Bridges

1.3 Submittals

- A. Certificates: Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.
- B. Traffic paint manufacturer's application instructions and a description and other data relative to the Contractor's application equipment and methods shall be submitted to the Engineer for approval.

1.4 Conditions

- A. Weather Limitations
 - 1. Apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least 40 degrees F.
 - 2. Do not conduct paving operations when surface is wet, frozen or contains excess moisture which would prevent uniform distribution and required penetration.
 - 3. Construct asphaltic courses only when atmospheric temperature in the shade meets the following conditions, and when the underlying base is dry and when weather is not rainy.
 - a. Less than 1" pavement layer - 55 degrees and rising.
 - b. 1" to 2" pavement layer - 45 degrees and rising.
 - c. 2" - thicker pavement layer - 35 degrees and rising.
 - 4. Place base course when air temperature is above 35 degrees F and rising. No base course shall be placed on a frozen or muddy subgrade.

Asphalt Concrete Paving

- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

1.5 Inspection and Testing

- A. Pavement and base testing will be performed by an independent testing laboratory selected by the Owner.
- B. The testing agency shall test in-place courses for compliance with specified compaction, thickness and surface smoothness requirements.
- C. The testing agency shall take one 4-inch diameter core per 2,500 square yards of paved surface at locations selected by the Engineer for density and thickness tests. Repair holes resulting from coring to match existing paving.
- D. Compaction
 - 1. Graded Aggregate Base: Minimum acceptable density shall be 98 percent of maximum dry density in accordance with ASTM D 1557, Method D. Conduct one test for each 2,500 square yards of in-place material, but in no case less than one daily for each layer. Test density of graded aggregate base according to ASTM D 2167.
 - 2. Asphaltic Concrete: Compare density of in-place material against laboratory specimen of same mixture. Minimum acceptable density of in-place material shall be 94 percent of the calculated voidless density based upon the effective specific gravity of the aggregate used. It is intended that acceptance density testing will be accomplished while the bituminous mixture is hot enough to permit further densification if such is shown to be necessary. If the density does not conform to the requirements stated herein above, the Contractor shall continue compactive effort until the required density is obtained.
- E. Pavement Thickness: Inspect the cores of the base, intermediate and surface courses to determine the average thickness of the course. If the average thickness exceeds the allowable variation below, additional cores shall be made at the Contractor's expense to determine the area of deficient thickness. The deficient area shall be corrected by overlay with the same type mix to the limits as determined by the Engineer.
 - 1. Base Course: $\pm 1/2$ -inch.
 - 2. Binder Course: $\pm 1/4$ -inch.
 - 3. Surface Course: $\pm 1/4$ -inch.
- F. Surface Smoothness: Test finished surface of each asphalt course for smoothness using a 10 foot straightedge. Intervals of tests shall be as directed by the Engineer. Surfaces will not be acceptable if exceeding the following:
 - 1. Base Course: 1/4-inch in 10 feet.

2. Binder Course: 1/4-inch in 10 feet.
 3. Surface Course: 1/8-inch in 10 feet.
- G. Contractor's Duties Relative to Testing
1. Notifying laboratory of conditions requiring testing.
 2. Coordinating with laboratory for field testing.
 3. Paying costs for additional testing performed beyond the scope of that required and for retesting where initial tests reveal non-conformance with specified requirements.
 4. Paying the cost of overlays or pavement removal and replacement which does not comply with the specified testing limits.

Part 2 Products

2.1 Materials

- A. Graded Aggregate Base Course: Graded aggregate base course shall be of uniform quality throughout and shall meet the requirements of Section 815.01 of the Georgia Department of Transportation Standard Specifications.
- B. Binder Course: Binder course shall be of uniform quality throughout and shall conform to the requirements of Section 828, 19 mm Superpave, Type "B-Modified" of the Georgia Department of Transportation Standard Specifications.
- C. Surface Course: Surface course shall be of uniform quality throughout and shall conform to the requirements of Section 828, 12.5 mm Superpave Type "E" of the Georgia Department of Transportation Standard Specifications.
- D. Tack coat shall conform to the requirements of Section 413 of the Georgia Department of Transportation Standard Specifications.

Part 3 Execution

3.1 Surface Preparation

- A. Graded Aggregate Base Course
 1. Check subgrade for conformity with elevations and section immediately before placing aggregate base material.
 2. Place aggregate base material in compacted layers not more than 6-inches thick, unless continuing tests indicate that the required results are being contained with thicker layers.

Asphalt Concrete Paving

3. In no case shall more than 8-inches of compacted base be placed in one lift.
 4. Spread, shape, and compact all aggregate base material deposited on the subgrade during the same day.
 5. The compacted base shall have sufficient stability to support construction traffic without pumping.
 6. If compacted base becomes unstable as a result of too much moisture, the base material and underlying subgrade, if necessary, shall be dried and reworked to a moisture content that can be recompacted.
- B. Loose and Foreign Material
1. Remove loose and foreign material from surface immediately before application of paving.
 2. Use power brooms or blowers, and hand brooming as required.
 3. Do not displace surface material.
- D. Tack Coat
1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and similar surfaces.
 2. Apply at a rate of 0.05 to 0.15 gallon per square yard of surface.
 3. Apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
 4. Allow surfaces to dry until material is at condition of tackiness to receive pavement.

3.2 Equipment

- A. Provide size and quantity of equipment to complete the work specified within the Project time schedule.
- B. Bituminous pavers shall be self-propelled that spread hot asphalt concrete mixtures without tearing, shoving or gouging surfaces, and control pavement edges to true lines without use of stationary forms.
- C. Rolling equipment shall be self-propelled, steel-wheeled and pneumatic-tired rollers that can reverse direction without backlash.
- D. Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified.

3.3 Asphaltic Concrete Placement

- A. Place asphalt concrete mix on prepared surface, spread and strike-off using paving machine.
- B. Spread mixture at a minimum temperature of 325 degrees F with a variance of 20 degrees +/-.
- C. Inaccessible and small areas may be placed by hand.
- D. Place each course at a thickness such that when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated.
- E. Pavement Placing
 - 1. Unless otherwise directed, begin placing along centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.
 - 2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
 - 3. Complete base courses for a section before placing surface courses.
 - 4. Place mixture in as continuous an operation as practical.
- F. Hand Placing
 - 1. Spread, tamp, and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to Engineer.
 - 2. Place mixture at a rate that will ensure handling and compaction before mixture becomes cooler than acceptable working temperature.
- G. Joints
 - 1. Carefully make joints between old and new pavements, or between successive days work, to ensure a continuous bond between adjoining work.
 - 2. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
 - 3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
 - 4. Offset transverse joints in succeeding courses not less than 24-inches.
 - 5. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness.

Asphalt Concrete Paving

6. Offset longitudinal joints in succeeding courses not less than 6-inches.
7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

3.4 Asphaltic Concrete Compaction

- A. Provide sufficient rollers to obtain the required pavement density.
- B. Begin rolling operations as soon after placing as the mixture will bear weight of roller without excessive displacement.
- C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
- D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- F. Do not roll centers of sections first under any circumstances.
- G. Breakdown Rolling
 1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
 2. Operate rollers as close as possible to paver without causing pavement displacement.
 3. Check crown, grade, and smoothness after breakdown rolling.
 4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- H. Second Rolling
 1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
 2. Continue second rolling until mixture has been thoroughly compacted.
- I. Finish Rolling
 1. Perform finish rolling while mixture is still warm enough for removal of roller marks.
 2. Continue rolling until roller marks are eliminated and course has attained specified density.

- J. Patching
 - 1. Remove and replace defective areas.
 - 2. Cut-out and fill with fresh, hot asphalt concrete.
 - 3. Compact by rolling to specified surface density and smoothness.
 - 4. Remove deficient areas for full depth of course.
 - 5. Cut sides perpendicular and parallel to direction of traffic with edges vertical.
 - 6. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

3.5 Cleaning and Protection

- A. Cleaning: After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the Engineer.
- B. Protection
 - 1. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case no sooner than six hours.
 - 2. Provide barricades and warning devices as required to protect pavement and the general public.
- C. Maintenance: The Contractor shall maintain the surfaces of pavements until the acceptance of the Project. Maintenance shall include replacement, overlay, milling and reshaping as necessary to prevent raveling of the road material, the preservation of smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the Engineer.

3.6 Supervision and Approval

- A. Pavement shall meet the requirements of the regulatory agency responsible for the maintenance of pavement. Obtain agency approval of pavement before requesting final payment.
- B. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.

END OF SECTION

Part 1 General

1.1 Work Included

- A. Concrete curbs.
- B. Concrete gutters.
- C. Concrete combination curb and gutter.
- D. Concrete sidewalks.

1.2 Measurement for Payment

- A. Sidewalks: The quantities of sidewalks to be paid for will be the number of square yards of each depth of sidewalk constructed as indicated.
- B. Curbs and Gutters: The quantities of curbs and gutters to be paid for will be the number of linear feet of each cross section constructed as indicated, measured along the face of the curb at the gutter line.

1.3 Basis for Payment

- A. Sidewalks: Payment of the quantities of sidewalks measured as specified will be at the contract unit price per square yard of the thickness specified.
- B. Curbs and Gutters: Payment of the quantities of curbs and gutters measured as specified will be at the contract unit price per linear foot of each cross section.

1.4 System Description

- A. General Requirements
 - 1. Provide plant, equipment, machines, and tools used in the work subject to approval and maintained in a satisfactory working condition at all times. The equipment shall have the capability of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified.
 - 2. Use of the equipment shall be discontinued if it produces unsatisfactory results.
 - 3. The Engineer shall have access at all times to the plant and equipment to ensure proper operation and compliance with specifications.
- B. Slip Form Equipment: Slip form paver or curb forming machine, will be approved based on trial use on the job and shall be self-propelled, automatically controlled,

crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in one pass.

1.5 Submittals

- A. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
- B. Submit manufacturer/supplier certifications for aggregate and cement. Provide the project identification name and number, date of report, name of Contractor, name of concrete testing service, source of concrete aggregates, materials manufacturer and brand name for manufactured materials, values specified in the referenced specification for each material, and test results.
- C. Submit mix design in accordance with ACI requirements. Provide for each mix design, the project name, city, general contractor, concrete strength, and its intended use.
- D. Submit 2 copies of laboratory test reports with standard deviation analysis or trial batch data. All concrete materials shall be listed.

1.6 Environmental Requirements

- A. Placing During Cold Weather
 - 1. Do not place concrete when the air temperature reaches 40 degrees F and is falling, or is already below that point.
 - 2. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Make provisions to protect the concrete from freezing during the specified curing period.
 - 3. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection shall be approved in writing. Approval will be contingent upon full conformance with the following provisions.
 - 4. The underlying material shall be prepared and protected so that it is entirely free of frost when the concrete is deposited.
 - 5. Aggregates shall be heated as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating shall be approved.
 - 6. The aggregates shall be free of ice, snow, and frozen lumps before entering the mixer.
 - 7. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

B. Placing During Warm Weather

1. The temperature of the concrete as placed shall not exceed 85 degrees F except where an approved retarder is used. The mixing water and/or aggregates shall be cooled, if necessary, to maintain a satisfactory placing temperature. The placing temperature shall not exceed 95 degrees F at any time.

Part 2 Products

2.1 Concrete

- A. Provide concrete conforming to the applicable requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE except as otherwise specified. Concrete shall have a minimum compressive strength of 3000 psi at 28 days. Maximum size of aggregate shall be one inch. Submit copies of certified delivery tickets for all concrete used in the construction.
- B. Air Content
1. Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.
- C. Slump
1. The concrete slump shall be 2 inches plus or minus 1 inch where determined in accordance with ASTM C143.
- D. Reinforcement Steel
1. Reinforcement bars shall conform to ASTM A615. Wire mesh reinforcement shall conform to ASTM A1064.

2.2 Concrete Curing Materials

- A. Impervious Sheet Materials: Impervious sheet materials shall conform to ASTM C171, type optional, except that polyethylene film, if used, shall be white opaque.
- B. Burlap: Burlap shall conform to AASHTO M 182.
- C. White Pigmented Membrane-Forming Curing Compound: White pigmented membrane-forming curing compound shall conform to ASTM C309, Type 2.

2.3 Concrete Protection Materials

- A. Concrete protection materials shall be a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically

for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.4 Joint Filler Strips

- A. Contraction Joint Filler for Curb and Gutter: Contraction joint filler for curb and gutter shall consist of hard-pressed fiberboard.
- B. Expansion Joint Filler, Premolded
 - 1. Expansion joint filler, premolded, shall conform to ASTM D1751 or ASTM D1752, 1/2 inch thick, unless otherwise indicated.

2.5 Joint Sealants

- A. Joint sealant, cold-applied shall conform to ASTM C920 or ASTM D5893.

2.6 Form Work

- A. Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified.
- B. Forms shall be of wood or steel, straight, of sufficient strength to resist springing during depositing and consolidating concrete.
 - 1. Wood forms shall be surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects.
 - a. Wood forms shall have a nominal length of 10 feet.
 - b. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness.
 - 2. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points.
 - a. Ends of steel forms shall be interlocking and self-aligning.
 - b. Steel forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers.
 - c. Steel forms shall have a nominal length of 10 feet with a minimum of 3 welded stake pockets per form. Stake pins shall be solid steel rods with chamfered heads and pointed tips designed for use with steel forms.
- C. Sidewalk Forms: Sidewalk forms shall be of a height equal to the full depth of the finished sidewalk.

- D. Curb and Gutter Forms: Curb and gutter outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter as indicated and shall be securely fastened to and supported by the outside form.
 - 1. Rigid forms shall be provided for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used.
 - 2. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together.
 - 3. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.
- E. [Detectable Warning System: Detectable Warning Systems shown on the contract plans are to meet requirements of ICC A117.1 - Section 705.]

Part 3 Execution

3.1 Subgrade Preparation

- A. The subgrade shall be constructed to the specified grade and cross section prior to concrete placement.
- B. Subgrade shall be placed and compacted [as directed] [in conformance with Section [_____]].
- C. Sidewalk Subgrade: The subgrade shall be tested for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.
- D. Curb and Gutter Subgrade: The subgrade shall be tested for grade and cross section by means of a template extending the full width of the curb and gutter. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement.
- E. Maintenance of Subgrade: The subgrade shall be maintained in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed. The subgrade shall be prepared and protected to produce a subgrade free from frost when the concrete is deposited.

3.2 Form Setting

- A. Set forms to the indicated alignment, grade and dimensions.
- B. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet.

Concrete Sidewalks and Curbs and Gutters

1. Corners, deep sections, and radius bends shall have additional stakes and braces, as required.
 2. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms.
- C. Forms shall be removed without injuring the concrete.
1. Bars or heavy tools shall not be used against the concrete in removing the forms.
- D. Any concrete found defective after form removal shall be promptly and satisfactorily repaired.
- E. Forms shall be cleaned and coated with form oil each time before concrete is placed.
1. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.
- F. Sidewalks
1. Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 1/4 inch in any 10 foot long section.
 2. After forms are set, grade and alignment shall be checked with a 10 foot straightedge.
 3. Forms shall have a transverse slope [as indicated] [1/4 inch per foot] with the low side adjacent to the roadway. Side forms shall not be removed for 12 hours after finishing has been completed.
- G. Curbs and Gutters
1. The forms of the front of the curb shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed.
 2. Forms back of curb shall remain in place until the face and top of the curb have been finished, as specified for concrete finishing.
 3. Gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction.

3.3 Sidewalk Concrete Placement and Finishing

A. Formed Sidewalks

1. Place concrete in the forms in one layer. When consolidated and finished, the sidewalks shall be of the thickness indicated.

2. After concrete has been placed in the forms, a strike-off guided by side forms shall be used to bring the surface to proper section to be compacted.
3. The concrete shall be consolidated by tamping and spading or with an approved vibrator, and the surface shall be finished to grade with a strike off.

B. Concrete Finishing

1. After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. A scored surface shall be produced by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.
2. Edge and Joint Finishing:
 - a. All slab edges, including those at formed joints, shall be finished with an edger having a radius of 1/8 inch.
 - b. Transverse joint shall be edged before brooming, and the brooming shall eliminate the flat surface left by the surface face of the edger.
 - c. Corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing shall be cleaned and filled solidly with a properly proportioned mortar mixture and then finished.

- C. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.4 Curb and Gutter Concrete Placement and Finishing

- A. Formed Curb and Gutter: Concrete shall be placed to the section required in a single lift. Consolidation shall be achieved by using approved mechanical vibrators. Curve shaped gutters shall be finished with a standard curb "mule".
- B. Curb and Gutter Finishing: Approved slipformed curb and gutter machines may be used in lieu of hand placement.
- C. Concrete Finishing
 1. Exposed surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes.
 2. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch.
 3. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form

marks, and tool marks have been removed. The front curb surface, while still wet, shall be brushed in the same manner as the gutter and curb top.

4. The top surface of gutter and entrance shall be finished to grade with a wood float.
 5. Joint Finishing: Curb edges at formed joints shall be finished as indicated.
- D. Surface and Thickness Tolerances: Finished surfaces shall not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 Sidewalk Joints

- A. Sidewalk joints shall be constructed to divide the surface into rectangular areas.
1. Transverse contraction joints shall be spaced at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and shall be continuous across the slab.
 2. Longitudinal contraction joints shall be constructed along the centerline of all sidewalks 10 feet or more in width.
 3. Transverse expansion joints shall be installed at sidewalk returns and opposite expansion joints in adjoining curbs.
 4. Where the sidewalk is not in contact with the curb, transverse expansion joints shall be installed as indicated.
- B. Expansion joints shall be formed about structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated.
1. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.
- C. Sidewalk Contraction Joints: The contraction joints shall be formed in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness, using a jointer to cut the groove, or by sawing a groove in the hardened concrete with a power-driven saw, unless otherwise approved.
1. Sawed joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the depth indicated.
 2. An ample supply of saw blades shall be available on the job before concrete placement is started, and at least one standby sawing unit in good working order shall be available at the jobsite at all times during the sawing operations.
- D. Sidewalk Expansion Joints

1. Expansion joints shall be formed with 1/2 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1752 or building paper.
 2. Joint filler shall be held in place with steel pins or other devices to prevent warping of the filler during floating and finishing.
 3. Immediately after finishing operations are completed, joint edges shall be rounded with an edging tool having a radius of 1/8 inch, and concrete over the joint filler shall be removed.
 4. At the end of the curing period, expansion joints shall be cleaned and filled with cold-applied joint sealant.
 5. Joint sealant shall be gray or stone in color.
 6. The joint opening shall be thoroughly cleaned before the sealing material is placed.
 7. Sealing material shall not be spilled on exposed surfaces of the concrete.
 8. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material.
 9. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.
- E. Reinforcement Steel Placement
1. Reinforcement steel shall be accurately and securely fastened in place with suitable supports and ties before the concrete is placed.

3.6 Curb and Gutter Joints

- A. Curb and gutter joints shall be constructed at right angles to the line of curb and gutter.
- B. Contraction Joints
1. Contraction joints shall be constructed directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length.
 2. Contraction joints (except for slip forming) shall be constructed by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Separators shall be removed as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

3. When slip forming is used, the contraction joints shall be cut in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. The depth of cut shall be at least one-fourth of the gutter/curb depth and 1/8 inch in width.

C. Expansion Joints

1. Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement, and shall be of the same type and thickness as joints in the pavement.
2. Where curb and gutter do not abut portland cement concrete pavement, expansion joints at least 1/2 inch in width shall be provided at intervals not less than 30 feet nor greater than 120 feet.
3. Expansion joints shall be provided in nonreinforced concrete gutter at locations indicated.
4. Expansion joints shall be sealed immediately following curing of the concrete or as soon thereafter as weather conditions permit.
5. Expansion joints and the top 1 inch depth of curb and gutter contraction-joints shall be sealed with joint sealant.
6. The joint opening shall be thoroughly cleaned before the sealing material is placed.
7. Sealing material shall not be spilled on exposed surfaces of the concrete.
8. Concrete at the joint shall be surface dry and atmospheric and concrete temperatures shall be above 50 degrees F at the time of application of joint sealing material.
9. Excess material on exposed surfaces of the concrete shall be removed immediately and concrete surfaces cleaned.

3.7 Curing and Protection

A. General Requirements

1. Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation.
2. Protect unhardened concrete from rain and flowing water.
3. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready for use before actual concrete placement begins.

4. Protection shall be provided as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

B. Mat Method

1. The entire exposed surface shall be covered with 2 or more layers of burlap.
2. Mats shall overlap each other at least 12 inches.
3. The mat shall be thoroughly wetted with water prior to placing on concrete surface and shall be kept continuously in a saturated condition and in intimate contact with concrete for not less than 72 hours.

C. Impervious Sheeting Method

1. The entire exposed surface shall be wetted with a fine spray of water and then covered with impervious sheeting material.
2. Sheets shall be laid directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used.
3. The curing medium shall not be less than 18-inches wider than the concrete surface to be cured, and shall be securely weighted down by heavy wood planks, or a bank of moist earth placed along edges and laps in the sheets.
4. Sheets shall be satisfactorily repaired or replaced if torn or otherwise damaged during curing.
5. The curing medium shall remain on the concrete surface to be cured for not less than 72 hours.

D. Membrane Curing Method

1. A uniform coating of white-pigmented membrane-curing compound shall be applied to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Formed surfaces shall be coated immediately after the forms are removed and in no case longer than 1 hour after the removal of forms.
2. Concrete shall not be allowed to dry before the application of the membrane. If any drying has occurred, the surface of the concrete shall be moistened with a fine spray of water and the curing compound applied as soon as the free water disappears.
3. Curing compound shall be applied in two coats by hand-operated pressure sprayers at a coverage rate of approximately 200 square feet/gallon for the total of both coats.
4. The second coat shall be applied in a direction approximately at right angles to the direction of application of the first coat.

5. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel and shall be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, an additional coat shall be applied to the affected areas within 30 minutes.
6. Concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied shall be resprayed by the method and at the coverage specified above.
7. Areas where the curing compound is damaged by subsequent construction operations within the curing period shall be resprayed.
8. Necessary precautions shall be taken to ensure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints.
9. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed before the concrete in the region of the joint is resprayed with curing compound. The method used for sealing the joint groove shall prevent loss of moisture from the joint during the entire specified curing period.
10. Approved standby facilities for curing concrete pavement shall be provided at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time.
11. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from any other possible damage to the continuity of the membrane.

3.8 Backfilling

- A. After curing, debris shall be removed and the area adjoining the concrete shall be backfilled, graded, and compacted to conform to the surrounding area in accordance with lines and grades indicated.

3.9 Protection

- A. Completed concrete shall be protected from damage until accepted.
- B. Repair damaged concrete and clean concrete discolored during construction. Concrete that is damaged shall be removed and reconstructed for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Removed damaged portions shall be disposed of as directed.
- C. Protective Coating

1. Protective coating, of linseed oil mixture, shall be applied to the exposed-to-view concrete surface after the curing period, if concrete will be exposed to de-icing chemicals within 6 weeks after placement.
2. Concrete to receive a protective coating shall be moist cured.
3. Application
 - a. Curing and backfilling operation shall be completed prior to applying two coats of protective coating.
 - b. Concrete shall be surface dry and clean before each application.
 - c. Coverage shall be by spray application at not more than 50 square yards/gallon for first application and not more than 70 square yards/gallon for second application, except that the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions.
 - d. Coated surfaces shall be protected from vehicular and pedestrian traffic until dry.
4. Precautions
 - a. Protective coating shall not be heated by direct application of flame or electrical heaters and shall be protected from exposure to open flame, sparks, and fire adjacent to open containers or applicators.
 - b. Material shall not be applied at ambient or material temperatures lower than 50 degrees F.

3.10 Field Quality Control

- A. Submit copies of all test reports within 24 hours of completion of the test.
- B. General Requirements
 1. Perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing.
 2. Based upon the results of these inspections and tests, take the action and submit reports as required below, and any additional tests to ensure that the requirements of these specifications are met.
- C. Concrete Testing
 1. Strength Testing: Provide molded concrete specimens for strength tests. Samples of concrete placed each day shall be taken not less than once a day nor less than once for every 250 cubic yards of concrete. The samples for strength tests shall be taken in accordance with ASTM C172. Cylinders for

acceptance shall be molded in conformance with ASTM C31 by an approved testing laboratory. Each strength test result shall be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

2. **Air Content:** Determine air content in accordance with ASTM C173 or ASTM C231. ASTM C231 shall be used with concretes and mortars made with relatively dense natural aggregates. Two tests for air content shall be made on randomly selected batches of each class of concrete placed during each shift. Additional tests shall be made when excessive variation in concrete workability is reported by the placing foreman or the Owner's inspector. If results are out of tolerance, the placing foreman shall be notified and he shall take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.
3. **Slump Test:** Two slump tests shall be made on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Additional tests shall be performed when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.
4. **Thickness Evaluation:** The anticipated thickness of the concrete shall be determined prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, the subgrade shall be true to grade prior to concrete placement and the thickness will be determined by measuring each edge of the completed slab.
5. **Surface Evaluation:** The finished surface of each category of the completed work shall be uniform in color and free of blemishes and form or tool marks.

3.11 Surface Deficiencies and Corrections

- A. **Thickness Deficiency:** When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.
- B. **High Areas:** In areas not meeting surface smoothness and plan grade requirements, high areas shall be reduced either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete shall not exceed 5 percent of the area of any integral slab, and the depth of grinding shall not exceed 1/4 inch. Areas requiring

grade or surface smoothness corrections in excess of the limits specified above shall be removed and replaced.

- C. Appearance: Exposed surfaces of the finished work will be inspected by the Owner and any deficiencies in appearance will be identified. Areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work shall be removed and replaced.

3.12 Detectable Warning System

- A. Install Detectable Warning Systems required by contract plans per ICC A117.1, Section 705, and by manufacturers' installation instructions.

END OF SECTION

PVC Coated Galvanized Chain Link Fences and Gates

Part 1 General

1.1 Work Included

- A. This Section includes the following:
 - 1. Chain-link fences.
 - 2. Gates: As shown on the plans.
- B. [Concrete Footing and mow strip]

1.2 Related Sections

- A. Section 03 30 00 - Cast-in-Place Concrete

1.3 Submittals

- A. Submit in accordance with Section 01 33 00.
- B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates:
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.
- C. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
- D. Samples for Verification: For each type of chain-link fence and gate indicated, provide sample of steel wire (for fabric) in 6-inch (150-mm) squares.
- E. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1083.

1.4 Quality Assurance

- A. Manufacturer: Company having manufacturing facilities in the United States with a minimum 5 years' experience specializing in manufacturing of chain link fence products.

PVC Coated Galvanized Chain Link Fences and Gates

- B. Fence contractor: Contractor having 5 years' experience installing similar projects in accordance with ASTM F567.
- C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.
- D. Substitutions: In accordance with Section 01 25 00.
- E. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.
- F. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.5 Warranty

- A. Special Warranty: Manufacturer's standard form in which CONTRACTOR agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, finishes, and other materials beyond normal weathering.
 - b. Deflection of fence fabric beyond design limits.
 - 2. Products furnished in this section shall be guaranteed in writing by the manufacturer's standard warranty in addition to CONTRACTOR's one year warranty.

Part 2 Products

2.1 Posts, Rails, and Braces

- A. Steel pipe Type I: ASTM F1043 Group IA, ASTM F1083 standard weight schedule 40 hot-dip galvanized pipe having a zinc coating of 1.8 oz./ft² (550 g/m²) on the outside surface and 1.8 oz./ft² (550 g/m²) on the inside surface. Exterior of pipe to have F1043 PVC thermally fused color coating, minimum thickness 10 mils (0.254 mm).
 - 1. Regular Grade: Minimum steel yield strength of 30,000 psi.
 - 2. Intermediate Strength Grade: Minimum steel yield strength of 50,000 psi.
 - 3. High Strength 83000 Grade: Minimum steel yield strength 83,000 psi.
- B. Steel pipe Type II: Cold formed electric resistance welded steel pipe complying with ASTM F1043 Group IC having minimum steel yield strength of 50,000 psi (344

MPa). External protective coating F1043 Type B, 0.9 oz./ft² (270 g/m²) minimum hot-dip zinc coating plus a chromate conversion and a clear polymer coating, plus a minimum 10 mil (0,254 mm) thermally fused PVC color coating in accordance with F1043. Internal coating F1043 Type D, 81% nominal zinc pigmented coating minimum 3 mils (0.0076 mm) thick or Type B, minimum 0.9 oz./ft² (275 g/m²) zinc.

- C. Formed steel "C" sections: Roll formed steel shapes complying with ASTM F1043, Group II, 50,000 psi (344 MPa) minimum steel yield strength. External coating, ASTM F1043 Type A, minimum average zinc coating of 2.0 oz./ft² (610 g/m²) in accordance with ASTM A 123. The complete surface area of the rolled formed C post shall have a minimum 10 mil (0,254 mm) thermally fused PVC color coating in accordance with F1043.
- D. End, Corner, and Pull Post:
 - 1. For fence up to and including 6 feet 0 inches in height, [2.375 inch OD Type I ASTM F1083 Regular Grade Pipe] [2.375 inches outside diameter, Type 2 ASTM F1043 Group IC Pipe]
 - 2. For fence from 6 feet 1 inch to 8 feet 0 inches in height, [2.875 inch OD Type I ASTM F1083 Regular Grade Pipe] [2.875 inches outside diameter, Type 2 ASTM F1043 Group IC Pipe]
 - 3. For fence 8 feet 0 inches to and including 12 feet 0 inches in height, [4.00 inch OD Type I ASTM F1083 Regular Grade Pipe] [4.00 inches outside diameter, Type 2 ASTM F1043 Group IC Pipe]
- E. Line Posts (10 feet 0 inches Maximum Spacing):
 - 1. Fabric Up To 8 feet 0 inches in Height: [C-section, ASTM F1043, Group II 1.875 inches by 1.625 inches.] [[2.375 inch OD Type I ASTM F1083 Regular Grade Pipe] [2.375 inches outside diameter, Type 2 ASTM F1043 Group IC Pipe]
 - 2. Fabric Over 8 feet 0 inches to 12 feet 0 inches in Height: [C-section, ASTM F1043, Group II, 3.25 inches by 2.5 inches] [2.875 inch OD Type I ASTM F1083 Regular Grade Pipe] [2.875 inches outside diameter, Type 2 ASTM F1043 Group IC Pipe]
- F. Top Rail and Braces:
 - 1. The top rail and braces shall be [1.625 inches by 1.25 inches roll formed section with a minimum bending strength of 192 pounds] [1.660 inches outside diameter, Schedule 40 pipe].

2.2 Chain Link Fabric

- A. The fabric shall match existing fence.
- B. Selvage Edges: Fabric in heights 60 inches and less shall be knuckled at both selvages. Fabric 72 inches and more shall be knuckled at the bottom selvage and

be twisted and barbed at the top.

- C. Finishes: Poly Vinyl Chloride (PVC) color coated steel chain link fabric per ASTM F668 Class _____

2.3 Fittings

- A. All fittings to be PVC thermally fused color coated having a minimum thickness of 0.006" (0.152 mm) per ASTM F626. PVC color to match fabric and framework. Moveable parts, nuts and bolts to be field coated with PVC liquid touch up after installation.
- B. Post caps: ASTM F626 galvanized pressed steel, malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. "C" shaped line post without top rail do not require post caps. When top rail is specified provide line post loop tops to secure top rail.
- C. Rail ends: Galvanized pressed steel per ASTM F626, for connection of rails to post using a brace band.
- D. Top rail sleeves: 7" (178 mm) galvanized steel sleeve per ASTM F626.
- E. Wire ties: [9 gauge (0.148") (3.76 mm) galvanized steel wire for attachment of fabric to line posts and rails.][double wrap 13 gauge (0.092") (2.324 mm) galvanized steel wire for rails and braces] Pre-formed hog ring ties to be 9 gauge (0.148") (3.76 mm) galvanized steel or aluminum for attachment of fabric to tension wire. Tie wire and hog rings PVC coated and in compliance with ASTM F626. Color to match fabric color.
- F. Brace and tension (stretcher bar) bands: ASTM F626 galvanized 12 gauge (0.105") (2.67mm) pressed steel by 3/4" (19mm) formed to a minimum 300 degree profile curvature for post attachment. Secure bands using minimum 5/16" (7.94 mm) galvanized carriage bolt and nut.
- G. Tension (stretcher) bars: Galvanized steel one piece length equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) per ASTM F626. Provide tension (stretcher) bars where chain link fabric is secured to the terminal post.
- H. Truss rod assembly: Galvanized steel minimum 5/16" (7.9mm) diameter truss rod with pressed steel tightener, in accordance with ASTM F626.
- I. Barbed wire supporting arms: Galvanized pressed steel barb arm per ASTM F626 with provisions for attaching barbed wire. Provide arms with loop hole for applications with top rail. Arms shall withstand 250 lb. (113.5 kg) downward pull at outermost end of arm without failure. Arms provide an additional 13 in. (330 mm) in height. **[Type I, 45° 3 strand single arm] [Type III 6 strand "V" arms].**
- J. Carriage bolts and nuts: Galvanized of commercial quality.

2.4 Tension Wire

- A. Tension wire: Poly Vinyl Chloride (PVC) coated metallic coated steel tension wire per ASTM F 1664 [**7 gauge steel core wire, 0.177" (4.50 mm)**] [**9 gauge steel core wire, 0.148 (3.76 mm)**] PVC coating class and color to match chain link fabric.

2.5 Barbed Wire

- A. Barbed wire: PVC coated barbed wire in compliance with ASTM F1665, coating class and color to match chain link fabric. Double strand twisted 14 gauge 0.80" (2.03 mm) PVC coated strand wire, 14 gauge 0.80" (2.03 mm) zinc coated or aluminum alloy 4 point barbs spaced [**Type I standard 5" (127 mm) on center**] [**Type II High Security 3" (76mm) on center**].

2.6 Chain Link Swing Gate

- A. Swing gates [**double leaf**] [**single leaf**] ____ft ____inch opening by ____ft ____inch high [**plus 1' 0" (304.8 mm) 3 strands barbed wire.**] Fabricate chain link swing gates in accordance with ASTM F900. Gate frame to be of welded construction. Weld areas to be protected with zinc-rich paint per ASTM A780, then over-coat with liquid PVC to match frame. The gate frame members are to be spaced no greater than 8' 0" (2.44 m) apart horizontally or vertically. Exterior members to be 1.900" (48.3 mm) OD pipe, interior members when required shall be 1.660" (42.2 mm) OD pipe. PVC coated pipe to be [**Grade 1 ASTM F1083**] [**Grade 2 ASTM F1043 Group IC**] per section 2.1. Chain link fabric to match specification of fence system. Fabric to be stretched tightly and secured to vertical outer frame members using tension bar and tension bands spaced 12" (304.8 mm) on center and tied to the horizontal and interior members 12" (304.8 mm) on center using 9 gauge galvanized steel ties per section 2.3.
- B. Hinges, hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad).
- C. Latch: Galvanized forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
- D. Double gates: Provide galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.
- E. Gate holdback: Provide galvanized gate hold back keeper for each gate leaf over 5' (1524 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- F. Gate posts: PVC color coated [Grade 1 pipe ASTM F1083] [Grade 2 pipe ASTM F1043 Group IC] per section 2.2, _____OD.

2.7 Chain Link Internal Track Aluminum Cantilever Slide Gate

- A. Aluminum cantilever slide gate [**double leaf**] [**single leaf**] ____ft ____inch opening by ____ft ____inch high [plus 1' 0" (304.8 mm) 3 strands of barbed wire] shall be of the internal roller design per ASTM F1184 Type II Class 2. Cantilever slide gate to be constructed of PVC color coated ASTM B221 aluminum members welded and designed for maximum structural integrity. Vertical external and internal members minimum 2" (50 mm) square, spaced maximum 8' 0" (2.44 m) on center. Gates having fabric greater than 8' 0" (2.44 m) in height require a horizontal member. The top horizontal member shall be a one-piece precision extruded structural framing member having an integral enclosed track. Bottom horizontal member to be minimum 2" x 4" (50 x 100 mm). Adjustable diagonal X trusses shall be installed in each gate panel to transfer the alternating forces as the gate slides. The gate opening portion shall be filled with chain link fabric stretched taut and secured to the frame members. Chain link fabric shall match the fence system specification. The overall gate structure shall be a minimum of 40% larger than the gate opening to support the cantilevered portion of the gate in the closed position with minimum deflection per ASTM F1184. The minimum 40% back frame does not require the installation of chain link fabric for those gates not to be electrically operated. **[Electrically operated gates per ASTM F2200 and UL 325 require the back frame to be filled with fabric.]** Single leaf cantilever design for openings larger than 30' 0" (9.15 m) up to 40' 0" (12.2 m) shall be fabricated by welding together two horizontal top structural/track members creating a dual track system. Single track gates up to 30' 0" (9.15 m) opening require two support posts and two internal truck assemblies. Dual track gates over 30' 0" (9.15 m) up to 40' 0" (12.2 m) require two sets of dual posts and four internal truck assemblies.
- B. Internal truck assemblies shall be capable of swiveling to accommodate gate movement and ensure full contact of the four support wheels and two guide wheels to the internal track surface. The galvanized steel truck assembly post bracket, truck assembly vertical support axle as well as the support wheels shall be designed to handle static and dynamic forces required to support and operate the gate. The truck assembly, support axle and internal wheels shall be comprised of stainless steel or galvanized steel components.
- C. Galvanized steel bottom guide roller brackets containing two 3" (75 mm) rubber wheels shall be supplied to keep the bottom of the gate plumb and in proper alignment.
- D. Single gates shall be supplied with a galvanized steel latch mechanism capable of securing the gate with a padlock accessible from either side. Double gates to have galvanized drop rod to hold inactive leaf and a latch mechanism capable of securing the gate with a padlock accessible from either side. Provide drop rod receiver to engage center drop rod. **[Electrically operated gates per ASTM F2200 and UL325 shall not contain any latch or locking mechanism]**
- E. Cantilever gate posts shall be 4.00" (101.6 mm) OD PVC coated **[Grade 1 pipe ASTM F1083] [Grade 2 pipe ASTM F1043 Group IC]** per section 2.2. Single leaf cantilevers up to 30' 0" (9.15 m) require three 4" (101.6 mm) OD posts, dual track single leaf cantilevers over 30' 0" (9.15 m) up to 40' 0" (12.2 m) require two sets of pre-fabricated dual 4.00" (101.6 mm) OD support posts and one 4" (101.6 mm) latch

post. Gate is supported in the center of the dual posts.

2.8 Post Setting Materials

- A. Concrete: Minimum 28 day compressive strength of 3,000 psi (20 MPa).
- B. Drive Anchors: Galvanized ASTM A36 steel drive anchor angle blades, **[1" x 1" (25 mm x 25 mm)] [1.25" x 1.25" (31.8 mm x 31.8 mm)]** x 30 " (762 mm) long secured to post with a galvanized shoe clamp.

Part 3 Execution

3.1 Examination

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by OWNER.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Preparation

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 100 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 Installation, General

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
 - 1. Install fencing on established boundary lines inside property line.

3.4 Chain-link Fence Installation

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

3. Concealed Concrete: Top 2-inches below grade to allow covering with surface material.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
 - D. Line Posts: Space line posts uniformly at 10 feet on center, or less.
 - E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
 1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
 - F. Tension Wire: Install according to ASTM F 567 and ASTM F 1916, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches on center. Install tension wire in locations indicated before stretching fabric.
 1. Top Tension Wire: Install tension wire through post cap loops.
 2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
 - G. [Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.]
 - H. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps. **[A center rail is required for fabric height 12' (3658 mm) and over.]**
 - I. [Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.]
 - J. Touch up any nicks or scratches of the PVC color coating with liquid PVC paint.
 - K. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
 1. Leave 1 inch between finish grade or surface and bottom selvage, unless otherwise indicated.
 - L. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull,

and gate posts with tension bands spaced not more than 15 inches on center

- M. Tie Wires: Power-fastened or manually fastened ties configured to wrap a full 360 degrees around rail or post and a minimum of 1 complete diamond of fabric. Twist ends one and one-half machine twists or three full manual twists, and cut-off protruding ends to preclude untwisting by hand.
 - 1. Maximum Spacing: Tie fabric to line posts at 12 inches on center and to braces at 24 inches on center
- N. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

3.5 Gate Installation

- A. Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be **[inward][outward][as shown on drawings]**. Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 6" (152 mm) diameter by 24" (610 mm) deep. Gate leaf holdbacks shall be installed on all double gates and all gate leafs greater than 5' (1524 mm) in width.
- B. Horizontal slide gates: Install cantilever and overhead horizontal slide gates and gate posts in accordance with ASTM F567. Horizontal sliding gates shall be plumb in the closed position with minimal ground clearance and slide with an initial force of 40 lbs. (18.14 kg). Double gate drop bar receiver shall be set in a minimum concrete footing 6" (152 mm) diameter by 24" (610 mm) deep. Install top and bottom safety roller covers and adjacent safety guide posts on ASTM F1184 Type II Class 2 external roller cantilever.

3.6 Field Quality Control

- A. Fabric Testing: Test fabric tension according to ASTM F 1916.
- B. Fence Post Rigidity Testing: Test line posts for rigidity according to ASTM F 1916.

3.7 Adjusting

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Seed bed preparation
- B. Seeding of disturbed areas
- C. Fertilizing and soil amendments, as necessary.
- D. Maintenance

1.2 References

- A. U.S. DEPARTMENT OF AGRICULTURE (USDA)
 - 1. AMS Seed Act (1940; R 1988; R 1998) Federal Seed Act
 - 2. DOA SSIR 42 (1996) Soil Survey Investigation Report No. 42, Soil Survey Laboratory Methods Manual, Version 3.0

1.3 Quality Assurance

- A. Prior to seeding operations, the Contractor shall furnish labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the Contractor of any responsibility or liability for furnishing seed meeting the requirements of this Section.
- B. Prior to placing topsoil, whether on site or imported, the Contractor shall obtain representative samples and furnish soil test certificates including textural, pH, and organic ignition analysis from the University of Georgia Agricultural Extension Service or other certified testing laboratory.

1.4 System Description

- A. This work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, sod, planting, etc., and shall include, but not necessarily be limited to, all seed bed preparation, the supplying and placing of soil additives, seed, and mulch wherever required by the Drawings or directed by the Engineer and maintenance.
- B. The work shall include temporary seeding to stabilize earthen surfaces during construction to minimize siltation and erosion. Temporary seeding shall be performed as shown on construction plans.

Seeding

- C. All existing lawns encountered shall be replaced with topsoil and seeding of the same type and quality as that existing prior to construction and shall be restored to original condition or better.
- D. Seed species, rate of seeding, planting dates, fertilization and other requirements are shown on the Drawings.

Part 2 Products

2.1 Topsoil

- A. On-Site Topsoil: Surface soil stripped and stockpiled on site and modified as necessary to meet the requirements specified for topsoil in paragraph entitled "Composition." When available, topsoil shall be existing surface soil stripped and stockpiled on-site.
- B. Off-Site Topsoil: Conform to requirements specified in paragraph entitled "Composition." Additional topsoil shall be furnished by the Contractor when directed by the Engineer and shall be justification for additional compensation to the Contractor.
- C. Composition: Containing from 5 to 20 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis Method described in DOA SSIR 42. Maximum particle size, 3/4 inch, with maximum 3 percent retained on 1/4 inch screen. Topsoil shall be reasonably free of perennial weeds, sticks, stones, roots, and other debris and objectionable materials. Topsoil shall be classifiable as loam, silt loam, clay loam, sandy loam or a combination thereof and shall have a pH between 5.5 and 7.0.

2.2 Grass Seed

- A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U.S. Department of Agriculture Federal Seed Act.
- B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet, or otherwise damaged in transit or storage.
- C. Seed shall bear the growers analysis testing to 98% for purity and 90% for germination. At the discretion of the Engineer, samples of seed may be taken for check against the grower's analysis.
- D. Species, rate of seeding, fertilization, and other requirements are shown on the Drawings.

2.3 Fertilizer Materials

- A. Fertilizer materials shall comply with applicable state, local, and federal laws concerned with their production and use.

- B. Commercial fertilizer shall be a ready mixed material and shall be equivalent to the grade or grades specified in the Seeding Requirements Table. Container bags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition.

2.4 Agricultural Limestone:

- A. Agricultural limestone shall be ground limestone or seashells having a calcium carbonate content of not less than 40 percent by weight. Agricultural limestone shall be crushed so that at least 90 percent of the material will pass a No. 10 mesh sieve and 25 percent will pass a No. 100 mesh screen.

2.5 Mulch:

- A. Mulch shall be free from noxious weeds, mold, and other deleterious materials.
- B. Mulch shall be composed of fiber mulch products or straw, specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.
- C. Straw mulch shall be partially decomposed stalks of wheat, rye, oats or other approved grain crops.

2.6 Mulch Binder

- A. Mulch on slopes exceeding 3 to 1 ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life and shall be acceptable to the Engineer.
- B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cut-back asphalt binder shall be Grade RC 70 or RC 250.

2.7 Inoculants for Legumes

- A. All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.8 Water

- A. The source of water shall be approved by Owner and of suitable quality for irrigation containing no element toxic to plant life.

Part 3 Execution

3.1 Securing and Placing Topsoil

- A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by the Engineer.

- B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed the product will be homogeneous in nature and will conform to the requirements of these Specifications.
- C. All areas from which topsoil is to be secured, shall be cleaned of all sticks, boards, stones, cement, ashes, cinders, slag, concrete, bitumen or its residue and any other refuse which will hinder or prevent growth.
- D. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the Engineer, the pit shall be abandoned.
- E. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed, unless otherwise approved by the Engineer.
- F. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.2 Seedbed Preparation

- A. Before fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line from unsightly variation, bumps, ridges and depressions and all detrimental material, roots and stones larger than 3-inches in any dimension shall be removed from the soil.
- B. Not earlier than 24 hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than 4-inches with a weighted disc, tiller, pulvimixer or other equipment, until the surface is smooth and in a condition acceptable to the Engineer.
- C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.
- D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition, as determined by the Engineer.

3.3 Fertilization and Liming

- A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates shown on the Drawings.
- B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of 1-inch.
- C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not

remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.

- D. Agricultural limestone shall be thoroughly mixed into the soil according to the rates shown in the Seeding Schedule shown on the Drawings. The specified rate of application of limestone may be reduced by the Engineer if pH tests indicate this to be desirable. It is the responsibility of the Contractor to obtain such tests and submit the results to the Engineer for adjustment in rates.
- E. It is the responsibility of the Contractor to make one application of a maintenance fertilizer according to the recommendations listed in the Seeding Schedule shown on the Drawings.

3.4 Seeding

- A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates shown on the Drawings unless otherwise approved by the Engineer. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.
- B. Seed shall be uniformly sown by any approved mechanical method suitable for the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder or approved mechanical power drawn seed drills. Hydro-seeding and hydro-mulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.
- C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8-inch by a cultipacker or suitable roller.
- D. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

3.5 Mulching

- A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied evenly so as to permit sunlight to penetrate and the air to circulate and at the same time shade the ground, reduce erosion and conserve soil moisture. Approximately 45 percent of the ground shall be visible through the mulch blanket.
- B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:

1. Fiber Mulch: 1 to 1.5 tons/acre.
 2. Straw: 1.5 to 2 tons/acre.
 3. These rates may be adjusted at the discretion of the Engineer at no additional cost to the Owner, depending on the texture and condition of the mulch material and the characteristics of the seeded area.
- C. Mulch on slopes greater than 3 to 1 ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt tacking agents shall be applied at the approximate rate of five gallons per 1,000 square feet as required to hold the mulch in place.
- D. The Contractor shall cover structures, poles, fences and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.
- E. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates in a manner acceptable to the Engineer.

3.6 Watering

- A. The Contractor shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain adequate water content in the soil.
- B. Watering shall be accomplished by hoses, tank truck or sprinklers in such a way to prevent erosion, excessive runoff and over-watered spots.

3.7 Maintenance

- A. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris and excess material and the premises shall be left in a neat and orderly condition.
- B. The Contractor shall maintain all seeded areas without additional payment until final acceptance of the work by the Owner, and any regrading, refertilizing, reliming, reseeding or remulching shall be done at Contractor's own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is accomplished. Damage resulting from erosion, gulleys, washouts or other causes shall be repaired by filling with topsoil, compacting and repeating the seeding work at Contractor's expense.

END OF SECTION

General

1.1 Description

- A. This Section includes all materials, labor, and equipment required to provide bypass flow control for manhole and sanitary sewer lines construction, upgrade, or rehabilitation.
- B. Furnish all power, maintenance, etc. to implement the bypass flow control and diversion pumping to divert the existing flow around the work area for the work's duration.
- C. The design, installation, and operation for the temporary bypass pumping system shall be solely the Contractor's responsibility.

1.2 Performance and Penalties

- A. The Contractor shall ensure:
 - 1. All temporary sewer bypass pumping activities for the work are completed in full compliance with the local, state and federal requirements, and no water quality or quantity compliance issues are encountered.
 - 2. No illicit pollutant discharges to (or to a location that would create contaminated water runoff to) a storm sewer, a stormwater conveyance, or a water body shall occur.
 - 3. All temporary sewer bypass pumping activities for the work are completed in full compliance with state and U.S. EPA regulations, and no water quality or quantity compliance issues are encountered.
- B. No discharge of sewage or debris shall be released to the environment. Should the Contractor's actions cause a sewage or debris overflow or bypass to the environment, site cleanup will be the Contractor's responsibility consistent with regulatory requirements. All overflow or bypass environmental cleanup activities shall be immediately commenced and prosecuted continuously by the Contractor. Any associated fines or penalties enacted by local or state regulatory agencies, the U.S. EPA, and/or any other regulatory groups or programs will be borne solely by the Contractor.

1.3 Quality Assurance

- A. Follow national standards and as specified herein.
- B. Perform leakage and pressure tests on discharge piping using clean water, before operation. Notify Engineer 24 hours prior to testing.
- C. Maintain and inspect temporary pumping system every two hours. Responsible

operator: on site when pumps are operating.

- D. Keep and maintain spare parts for pumps and piping on site, as required.
- E. Maintain adequate hoisting equipment and accessories on site for each pump.

1.4 Submittals

- A. Submit in accordance with Section 01 33 00 at least 4 weeks prior to commencing work, including plugging any line, bypass pumping, or similar actions.
 - 1. Detailed plan and description of proposed pumping system. Indicate number, size, material, location and method of installation of suction and discharge piping, size of pipeline or conveyance system to be bypassed, staging area for pumps, site access point, and expected flow.
 - a. Sewer plugging method and plug types
 - b. Size and location of manhole or access points for suction and discharge hose or piping.
 - c. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill, if buried.
 - d. Temporary pipe supports and anchoring required.
 - e. Thrust and restraint block sizes and locations.
 - f. Sewer plugging method and type of plugs.
 - g. Bypass pump sizes, capacity, number of each size to be on site and power requirements. Pump sizing shall clearly indicate compliance with requirements in this Section.
 - h. Backup pump, power and piping equipment.
 - i. Calculations of static lift, friction losses, and flow velocity. Pump curves showing pump operating range.
 - j. Design plans and computation for access to bypass pumping locations indicated on drawings.
 - k. Calculations for selection of bypass pumping pipe size.
 - l. Method of noise control for each pump and/or generator.
 - m. Method of protecting discharge manholes or structures from erosion and damage.
 - n. Schedule for installation and maintenance of bypass pumping lines.

- o. Procedures to monitor upstream mains for backup impacts.
 - p. Procedures for setup and breakdown of pumping operations.
 - q. Standby power generator size, location, and spill prevention and control measures
 - r. Emergency plan detailing procedures to be followed in event of pump failures, sewer overflows, service backups, and sewage spillage.
 - 1) Maintain copy of emergency plan on site for duration of project.
2. Certify bypass system will meet requirements of codes, and regulatory agencies having jurisdiction.

1.5 Contractor's Responsibility for Overflows and Spills

- A. Schedule and perform work in manner that does not cause or contribute to incidence of overflows, releases or spills of sewage from sanitary sewer system or bypass operation.

1.6 Delivery and Storage

- A. Transport, deliver, handle, and store pipe, fittings, pumps, ancillary equipment and materials to prevent damage and following manufacturer's recommendations.
 - 1. Inspect all material and equipment for proper operation before initiating work.
- B. Material found to be defective or damaged due to manufacturer or shipment.
 - 1. When Engineer deems repairable: Repair as recommended by manufacturer.
 - 2. When Engineer deems not repairable: Replace as directed by Engineer before initiating work.

Part 2 Products

2.1 Materials

- A. Discharge and Suction Pipes: Approved by Engineer.
 - 1. Discharge piping: Determined according to flow calculations and system operating calculations.
 - 2. Suction piping: Determined according to pump size, flow calculations, and manhole depth following manufacturer's specifications and recommendations.
- B. Polyethylene Plastic Pipe:
 - 1. High density solid wall and following ASTM F714 Polyethylene (PE) Plastic

Temporary Bypass Pumping Systems

- Pipe (SDR-DR) based on Outside Diameter, ASTM D1248 and ASTM D3550, with a minimum pressure rating of 2.5 times the total dynamic pump head.
2. Homogenous throughout, free of visible cracks, discoloration, pitting, varying wall thickness, holes, foreign material, blisters, or other deleterious faults.
 3. Defective areas of pipe: Cut out and joint fused as stated herein.
 4. Assembled and joined at site using couplings, flanges or butt-fusion method to provide leak proof joint. Follow manufacturer's instructions and ASTM D 2657.
 - a. Threaded or solvent joints and connections are not permitted.
 - b. Fusing: By personnel certified as fusion technicians by manufacturer of HDPE pipe and/or fusing equipment.
 - c. Butt-fused joint: True alignment and uniform roll-back beads resulting from use of proper temperature and pressure.
 - d. Allow adequate cooling time before removal of pressure.
 - e. Fused joints shall be watertight and have tensile strength equal to that of pipe.
 5. Use in streams, storm water culverts and environmentally sensitive areas.
- C. Flexible Hoses and Associated Couplings and Connectors.
1. Abrasion resistant.
 2. Suitable for intended service.
 3. Rated for external and internal loads anticipated, including test pressure.
 - a. External loading design: Incorporate anticipated traffic loadings, including traffic impact loading.
 - b. When subject to traffic loading, protect system, using products such as traffic ramps or covers.
 - c. Install system and maintain H-20 loading requirements while in use.
- D. Valves and Fittings: Determined according to flow calculations, pump sizes previously determined, and system operating pressures.
- E. Plugs: Selected and installed according to size of line to be plugged, pipe and manhole configurations, and based on specific site.
1. Additional plugs: Available in the event a plug fails. Plugs will be inspected before use for defects which may lead to failure.
- F. Aluminum "irrigation type" piping or glued PVC piping will not be permitted.

- G. Discharge hose will only be allowed in short sections when approved by Engineer. Hoses shall have no leaks, and all couplings shall be quick-connecting with gaskets.

2.2 Equipment

- A. All equipment used for bypass pumping shall be specifically designed for intended purpose. All piping, pumps, etc. in contact with sanitary sewage shall be manufactured with materials designed for use in a sewage environment.
- B. All pumps used shall be fully automatic self-priming units which do not require foot valves or vacuum pumps in the priming system.
- C. The pumps shall be electric, hydraulic, or diesel powered. Gasoline powered pumps may be used for bypass pumping of short segments for a limited duration (10 hours or less).
- D. All pumps used shall be constructed to allow dry running for long time periods to accommodate cyclical nature of wastewater flows.
- E. Above-ground pumps and/or power units shall be located inside a temporary portable berm to contain any fuel or sewage that may spill during the normal course of operation.
- F. The multiple pump header system shall have check valves to facilitate pump removal, service, and/or replacement while the system remains operational.
- G. All above ground pumps and/or power units shall be equipped with sound attenuation measures which reduce noise levels to 75-decibels maximum at a 30-foot distance from the equipment during all operation periods.[If equipment is operated between 8:00 PM and 6:00 AM, this equipment shall also be provided with a sound attenuation 3-sided enclosure including a roof constructed of 2 x 4 lumber frame with 1/2-inch plywood sheathing and two inch extruded polystyrene foam panels attached to the inside of the entire enclosure. The enclosure shall be portable to allow the enclosure to be moved when bypass pumping equipment is moved.]
- H. The discharge location (the point where the bypass main reenters the gravity sewer system) shall be constructed with adequate sealant materials to minimize sewer gas and odor release to the maximum extent possible.

2.3 Design Requirements

- A. Provide bypass sewage pumping, as required, around the section in which work is to be performed. Bypass pumping shall be the Contractor's full responsibility. The bypass system shall be a sufficient capacity to handle 2.0 times the peak flow, as provided by Owner for trunk lines, of the pipeline section being bypassed. Bypass pumping systems shall be designed to operate 24 hours per day.
- B. Provide pipeline plugs and pumps of adequate size to handle peak flow, and temporary discharge piping to ensure total flow of main can be safely diverted around section to be repaired.

Part 3 Execution

3.1 General Requirements

- A. At least 4 weeks prior to the desired start date of construction requiring bypass pumping, submit a detailed description of the method proposed for bypass pumping to the Engineer for review and approval. The description shall include all materials and equipment to be used, personnel, spare equipment, and sketches showing proposed pump-around setups. No work shall commence until the Engineer approves.
- B. Bypass pumping equipment shall include pumps, conduits, engines, and related equipment necessary to divert sewage flow around the section in which work is to be performed. Backup pumps shall be online and isolated from the primary system by valves. Include 100% mechanical redundancy installed online with a float or ultrasonic type system to switch to the standby system automatically if the primary system fails.
- C. Piping redundancy may be required for relatively long bypass piping lengths or large diameter bypass pipes as deemed necessary by the Engineer.
- D. Special design considerations shall be made for pump suction lifts greater than 23 feet.
- E. Make all arrangements for bypass pumping when the main is shut down for any reason. The system shall overcome any existing force main pressure on discharge.
- F. Suction and discharge points shall only be located at manholes.
- G. If at any time the Contractor is unable to properly bypass pump the sewage, construction will be stopped until the Contractor can continue work in an acceptable manner. Additional contract time for delays caused by improper equipment, labor, or breakdowns will not be considered.
- H. Service shall be maintained at all times. Surcharges due to plugging the sewer line for bypass pumping shall be maintained to prevent service backups and overflows at any point in the system.
- I. For rehabilitation projects, hose may be used for short runs with the Engineer's approval. If the anticipated bypass time exceeds 48-hours, use hard piping only. If using hose and the bypass time reaches 48-hours, the Contractor may either install hard piping to accomplish the bypass or restore flow until an approved bypass method can be employed. No modifications to the bypass system shall be made without Owner's approval.
- J. The bypass or diversion pumping system shall be able to pump all the sewage in the existing line under all weather and seasonal conditions. All pumping equipment to be used shall be submitted to the Engineer for review and approval.
- K. Bypass pumping systems are required to be operated and continuously monitored

24-hours per day for flow diversion.

- L. For mains being lined, the bypass pumping must be done one manhole upstream and continue for one manhole downstream of the line being rehabilitated in order to use flow through plugs at the insertion and end points. The liner bag may not be used as part of the bypass pumping system or as a plug in the line.
- M. For bypass or diversion pumping in overnight operations greater than 2 days, provide and maintain portable lighting systems as needed for monitoring and operation activities at the bypass pumping site(s).
- N. The temporary diversion pumping system shall be placed in operation prior to the commencement of work in the areas being bypassed. Minimum times of operation prior to the commencement of work are 1 hour for small diameter CIPP lining and 4 hours for any other major system work such as trunk sewer diversion, large diameter sewer lining, or pumping station work.
- O. Protect the bypass lines from damage in the areas of backhoe and excavation operations.
- P. Provide the necessary stop/start controls and a visual alarm indicating a pump malfunction for each pump. Each pump shall have a 0-30 inch Hg vacuum gauge on the inlet and a 0-60 psi pressure gauge on the outlet.

3.2 Preparation

- A. Determining location of bypass pipelines.
 - 1. Minimal disturbance to existing utilities.
 - 2. Field locate existing utilities in proposed bypass area.
- B. Obtain approvals for placement within public or private property.
- C. Obtain Engineer's approval of location.

3.3 Performance Requirements

- A. It is essential for operating the existing system being bypassed that no interruptions in the flow occur throughout the project's duration. Provide, maintain, and operate all temporary facilities such as dams, plugs, pumping equipment (primary and backup units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the incoming flow before it reaches the point where it would interfere with the work, carry it past the work area, and return it to the existing system downstream of the work.
- B. The temporary pumping system's design, installation, and operation shall be the Contractor's responsibility. The bypass system shall meet all codes and requirements for regulatory agencies having jurisdiction.
- C. Provide all necessary means to safely convey the sewage past the work area. The

Contractor will not be permitted to stop or impede the sewer main flows under any circumstances.

- D. No flow diversion around the work area shall be performed in a manner that will cause damage to or surcharging of the existing system. The diversion shall protect public and private property from damage and flooding.
- E. Protect water resources, wetlands, and other natural resources.

3.4 Installation and Removal

- A. Remove manhole sections or make connections to existing sewer and construct temporary bypass pumping structures at access location indicated on Drawings and as required to provide adequate suction conduit.
- B. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, remove in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.
- C. When working inside manhole or force main, exercise caution. Follow OSHA, Local, State and Federal requirements. Take required measures to protect workforce against sewer gases and/or combustible or oxygen-deficient atmosphere.
- D. Installation of Bypass Pipelines:
 - 1. Bypass pipeline installation is prohibited in all wetland areas.
 - 2. Pipeline may be placed along shoulder of roads. If in easements, the bypass pipeline shall be within the easement area acquired for the project.
 - a. Do not place in streets or sidewalks.
 - 3. When bypass pipeline crosses local streets and private driveways, place in roadway ramps.
 - a. When roadway ramps cannot be used, place bypass in trenches and cover with temporary pavement as approved by Engineer.
- E. During bypass pumping operation, protect sewer lines from damage inflicted by equipment.
- F. Upon completion of bypass pumping operations, and after the receipt of written permission from Engineer, remove piping, restore property to pre-construction condition and restore pavement.

3.5 Field Quality Control and Maintenance

- A. Testing: Prior to actual operation, test the bypass pumping discharge hard piping system for leaks and pressure using clean water. Bypass hard piping shall be

hydrostatically tested following each setup and prior to flow diversion or bypass to a minimum pressure 2.5 times the pump(s) total dynamic head. The Engineer shall be given a 24-hour notice prior to testing.

- B. Inspection: Inspect the bypass pumping system on a continuous basis to ensure the system is working properly. A daily checklist for physically inspecting the piping shall be required. The checklist shall contain all bypass pumping system components and shall be specifically developed to address aspects for the individual project. The daily checklist shall be submitted to and approved by the Engineer. The completed daily checklists will be maintained, available for review, and on-site for the project's duration.
- C. Maintenance Service: Ensure the temporary bypass pumping system is properly maintained and that a responsible operator shall be readily available at all times when pumps are operating.
- D. Monitoring
 - 1. During bypass pumping, continuously monitor all bypass pumping system components.
 - 2. A telemetry system or designated personnel to maintain 24-hour onsite monitoring shall be required to alert the Contractor to system malfunctions or high liquid levels in manholes.
 - 3. If bypass pumping activities are conducted near state waters or in other situations where a potential exists for a sewage release to potentially enter state waters by other than direct means, an in-line stream monitoring system shall be used to measure real-time conductivity and dissolved oxygen (DO) concentrations in 30-minute intervals at a minimum. The system shall be mounted in the receiving stream in the immediate downstream area(s) adjacent to the location(s) of the bypass piping system discharge to the gravity conveyance system. The system shall have web-portal capabilities with alarm functions for conductivity and DO. The alarm function shall be equipped with battery power and solar charging provisions and shall be able to send email and text messaging alarms to at least five devices.
- E. Additional Materials
 - 1. Spare parts for pumps and piping shall be kept on site as required.
 - 2. Adequate hoisting equipment for each pump and accessories shall be maintained on site.
 - 3. Keep an HDPE fusion machine on site for the duration of bypass pumping to facilitate immediate repairs to hard piping.

END OF SECTION

Part 1 General

1.1 Work Included

- A. Furnish and install modular precast concrete manhole sections, with tongue-and-groove joints, with masonry transition to lid frame, covers, anchorage and accessories.

1.2 Related Sections

- A. Section 31 20 00 – Earth Moving
- B. Section 31 23 33 - Trenching and Backfilling

1.3 Qualifications

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.4 Submittals

- A. Submit under provisions of Section 01 33 00 - Submittal Procedures.
- B. Shop Drawing: Indicate manhole locations, elevations, piping, and sizes and elevations of penetrations.
- C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.
- D. Certification for Fiberglass Reinforced Polyester (FRP) Manholes: As a basis of acceptance the FRP manhole manufacturer shall provide an independent certification which consists of a copy of the manufacturer's test report accompanied by a copy of the test results that the manhole has been sampled, tested, and inspected in accordance with the provisions of the specification of ASTM D 3753 and meets all requirements.

Part 2 Products

2.1 Concrete Materials

- A. Cement Mortar: Cement mortar shall conform to ASTM C270, Type M with Type II cement.
- B. Portland Cement: Submit certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes. Portland cement shall conform to ASTM C150/C150M, Type II for concrete used in concrete pipe, concrete pipe fittings, and manholes, and type optional with the Contractor for

cement used in concrete cradle, concrete encasement, and thrust blocking. Where aggregates are alkali reactive, as determined by Appendix XI of ASTM C33/C33M, a cement containing less than 0.60 percent alkalis shall be used.

- C. Portland Cement Concrete: Portland cement concrete shall conform to ASTM C94/C94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 2 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

2.2 Manholes

- A. General: Manholes shall be cylindrical, with a 48" minimum inside diameter. Increase diameter as indicated on drawings. Provide eccentric cone top sections.
- B. Precast Concrete Manholes:
 - 1. Precast concrete manhole risers, base sections, and tops shall conform to ASTM C478; [except that the minimum wall thickness shall be 6"].
 - 2. Base and first riser shall be monolithic.
 - 3. The manhole sidewall shall be of a length such that a minimum of one course and a maximum of 2 courses of bricks shall be placed on top of the unit to bring the casting to grade. A precast concrete adjusting ring may be used for this purpose, conforming to the height ranges specified for brick.
 - 4. [Xypex Admix C-1000 or approved equal shall be used for all manholes. Xypex Admix or approved equal shall be added to the concrete mix at time of batching. The manhole manufacturer shall submit specifications and the procedures for adding the Admix to the concrete. The Admix shall have a red-tinted coloring.]
 - 5. Precast manholes are to be manufactured by Cloud, Sherman Dixie or approved equal.
 - 6. Plastic Gasket For Precast Manholes: Preformed plastic gasket shall meet or exceed all requirements of FS SS-S-210-A, "Sealing Compound, Preformed Plastic for Pipe Joints," Type I, and ASTM C990, rope formed. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space when the manhole sections are installed. The sealing compound shall be protected by a suitable removable 2 piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. The flexible plastic gasket shall also meet the requirements of the following table:

Property	Test Method	Minimum	Maximum
Specific Gravity @ 77°F	ASTM D71	1.20	1.30
Ductility @ 77°F (5 cm/min)	ASTM D113	5.0	--
Softening Point (°F)	ASTM D36	320	--
Penetration @ 77°F (cm) (150 g-5 secs.)	ASTM D217	50	120

C. Glass-Fiber-Reinforced Polyester Manholes:

1. Shall conform to ASTM D3753.
2. Manhole cylinders, man way reducers, and connectors shall be produced from glass fiber-reinforced polyester resin with the construction determined by the particular process of manufacture and configuration. The manhole shall provide an area from which a grade ring can be installed to accept a typical metal ring and cover and have the strength to support a traffic load without damage to the manhole.
3. Dimension: The manhole shall be a circular cylinder, reduced at the top to a circular man way not smaller than 22-1/2" inside diameter. Nominal inside diameter shall be 48 inches. Tolerance on the inside diameter shall be +/- 1%. The minimum wall thickness for all FRP manholes at all depths shall be 0.50 inches. The maximum vertical height of the cone shall be thirty six (36") inches.
4. Configuration: The cone must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade. The cone shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, providing required monolithic design to prevent infiltration and/or exfiltration through the manhole.
5. Class: The manhole shall be manufactured for a load rating suitable for an AASHTO H-20 wheel load.
6. Stub outs and Connections: Connections to manhole shall be made via installation of SDR PVC sewer pipe stub outs to manhole, or Kor-N-Seal boots. Installation of SDR PVC sewer pipe must be performed by sanding, priming, and using resin fiber-reinforced hand layup. The resin and fiberglass shall be same type and grade as used in the fabrication of the fiberglass manhole. Kor-N-Seal boots may be installed by manhole manufacturer using fiberglass reinforced pipe stub out for Kor-N-Seal boot sealing surface.
7. Manhole Bottom: Manholes shall have resin fiber-reinforced bottoms. Provide a minimum of two 1 1/2 in. deep x 3 1/2 in. wide stiffening ribs completely enclosed with resin fiber-reinforcement. Provide minimum 3 in. anti-flotation ring. Manhole bottom shall be a minimum of 1/2 inch thick.
8. Marking and Identification: All manholes shall be marked in letters no less than 1" in height with the following information:
 - a. Manufacturer's name and trademark

- b. Manufacturer's factory location
 - c. Manufacturer's serial number
 - d. Manhole Length
 - e. ASTM Designation
 - f. Installation assists marks (vertical lines 90 deg. apart at base of manhole).
9. Quality Assurance/Quality Control:
- a. Examination: Each manhole component part shall be examined for dimensional requirements.
 - b. Composition Control: Controls on glass and resin content shall be maintained for all manufacturing processes and for each portion of manhole fabrication. Records shall be maintained of these control checks. Proper glass content may be shown by glass usage checks, by glass and resin application rate checks, in accordance with the material composition test in ASTM D3753, paragraph 8.8.1.
 - c. All required ASTM D3753 testing shall be completed and records of all testing shall be kept and copies of test results shall be presented to Owner upon written request.
10. Materials:
- a. FRP Manholes: All manholes shall be watertight. Glass-Fiber Reinforced Polyester Manholes shall be a one-piece monolithic designed unit constructed of glass-fiber reinforced, supplier certified, and unsaturated isophthalic polyester resin containing chemically enhanced silica to improve corrosion resistance, strength and overall performance. FRP manholes shall be manufactured in strict accordance with ASTM D3753.
 - b. Exterior Surface: For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added for a minimum thickness of 0.125 in. or a UV inhibitor shall be added directly to the resin to prevent photo degradation. Mixing lots of resins from different manufacturers shall not be permitted.
- D. Throat Rings: Adjustment throat rings shall be precast non-reinforced concrete rings having a maximum thickness of two inches (2"). The internal diameter shall not be less than twenty-four inches (24"), and the width shall be a minimum of five inches (5"). No more than six throat rings shall be used on any manhole.
- E. Initial Backfill Material (FRP Manholes): The initial backfill material shall be composed of well graded, crushed stone or gravel conforming to the following requirements unless modified by the Engineer.

Crushed Stone or Gravel	Percent
Passing 1-1/2 inch sieve	100
Passing 1 inch sieve	95 to 100
Passing 3/8 inch sieve	25 to 60
Passing No. 4 sieve	1 to 10
Passing No. 8 sieve	0 to 5

- F. Gaskets and Connectors: Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923, and shall be Trelleborg Kor-N-Seal I with Korband Expander, or approved equal.
- G. External Preformed Rubber Joint Seals: An external preformed rubber joint seal shall be an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" shall be tested for leakage in the same manner as pipelines. The seal shall be multi-section with a neoprene rubber top section and all lower sections made of Ethylene Propylene Diene Monomer (EPDM) rubber with a minimum thickness of 60 mils. Each unit shall consist of a top and bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be a non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. Extension sections shall cover up to two more adjusting rings. Properties and values are listed in the following tables:

Properties, Test Methods and Minimum Values for Rubber used in Preformed Joint Seals

Physical Properties	Test Methods	EPDM	Neoprene	Butyl Mastic
Tensile, psi	ASTM D412	1840	2195	
Elongation, %	ASTM D412	553	295	350
Tear Resistance, ppi	ASTM D624 (Die B)	280	160	
Rebound, %, 5 minutes	ASTM C972 (mod.)			11
Rebound, %, 2 hours	ASTM C972			12

2.3 Metal Items

- A. Cast Iron Frames, Covers, and Gratings for Manholes:
1. Frames and covers shall be ASTM A48, Class 30B cast iron or ductile iron, made accurately to the required dimensions; sound, smooth, clean, and free from blisters and other defects; not plugged or otherwise treated to remedy defects; machined so that covers rest securely in the frames with no rocking and are in contact with frame flanges for the entire perimeter of the contact surfaces; thoroughly cleaned subsequent to machining and before rusting begins; and with the actual weight in pounds stenciled or printed by the manufacturer on each casting in white paint.

2. Castings shall be Neenah R-1642, or equal, with clear inside diameter of 24 inches. The frames and covers shall have a combined weight of not less than 400 pounds.
 3. Watertight castings shall be Neenah R-1915-G or equal, with clear inside diameter of 24 inches.
 4. Refer to Standard Drawing for cover size and lettering.
- B. Manhole Steps
1. [Zinc-coated steel] [as indicated] conforming to 29 CFR 1910.27. [As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443M ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5.] Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.

Part 3 Execution

3.1 Examination

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

3.2 Preparation

- A. Coordinate placement of inlet and outlet required by other sections.
- B. Excavate for manhole in accordance with Section 31 20 00 – Earth Moving.

3.3 Placing Manhole Sections

- A. Level base area and place minimum twelve inches (12") compacted bedding.
- B. Concrete Manholes:
 1. Construct base slab of cast-in-place concrete or use precast concrete base sections. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections.
 2. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit.
 3. For cast-in-place concrete construction, either pour bottom slabs and walls

integrally or key and bond walls to bottom slab. No parging will be permitted on interior manhole walls.

4. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose. Parging will not be required for precast concrete manholes.
 5. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer.
 6. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.
- C. Coordinate with other sections of Work to provide correct size, shape, and location.
 - D. Backfill manhole in accordance with Section 31 23 33 - Trenching and Backfilling.

3.4 Masonry Construction

- A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- B. Lay masonry units in running bond.
- C. Form flush mortar joints.
- D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other Work.
- E. Set cover frames and covers level without tipping, to correct elevations.
- F. Coordinate with other sections of Work to provide correct size, shape, and location.
- G. Backfill manhole in accordance with Section 31 23 33 - Trenching and Backfilling.

END OF SECTION

Part 1 General

1.1 Work Included

- A. Construction of gravity sanitary utility piping, including piping, manholes, and appurtenances
- B. Testing and inspection

1.2 System Description

- A. Pipe material for sewer lines 18 inches and smaller shall be PVC unless otherwise shown on the Drawings. Ductile iron pipe shall be used only when so indicated on the Drawings.
- B. Pipe material for sewer lines larger than 18 inches shall be reinforced concrete, unless otherwise shown on the Drawings. Ductile iron pipe shall be used only when so indicated on the Drawings.

1.3 Submittals

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures
- B. Shop Drawings
 - 1. Detailed pipe drawings showing pipe details, special fittings and bends, dimensions, coatings, and other pertinent information
 - 2. Detailed manhole drawings showing details, connections, dimensions, castings, anti-flotation provisions and other pertinent information
- C. Product Data
 - 1. Pipe data, including pressure class, wall thickness, reinforcing, and strength calculations.
 - 2. Manufacturer's data for couplings, saddles, gaskets and other pipe accessories.
 - 3. Manhole data, including wall thickness, reinforcing, and strength calculations.
- D. Certification for Fiberglass Reinforced Polyester (FRP) Manholes: As a basis of acceptance, the FRP manhole manufacturer shall provide an independent certification which consists of a copy of the manufacturer's test report accompanied by a copy of the test results that the manhole has been sampled, tested, and inspected in accordance with the provisions of the specification of ASTM D 3753 and meets all requirements.

1.4 Quality Assurance

- A. Installer Qualifications: Install specified materials by a licensed underground utility Contractor licensed for such work in the state where the work is to be performed. Installing Contractor's License shall be current and be state certified or state registered.
- B. [All testing of clay and concrete pipe and materials will be made by a commercial testing laboratory. Before beginning work, furnish the Owner's Representative with the name of the pipe materials supplier. No pipe shall be delivered to the job site which does not bear the testing laboratory's stenciled or other marked sign of acceptance. Furnish the Owner with 2 certified copies of the testing laboratory's report of inspection, testing, and acceptance on all pipe and specials.
 - 1. [Reinforced concrete pipe shall be tested by and meet the requirements of the Permeability Test and Hydrostatic Test of ASTM C14.]]
- C. For PVC and ductile iron pipe, furnish a certificate from the pipe manufacturer indicating that the pipe meets all applicable requirements of these specifications.
 - 1. The minimum pipe stiffness for PVC pipe at 5 percent deflection shall be 46 psi for all sizes when tested in accordance with ASTM D2412; external loading properties of plastic pipe shall be by parallel plate loading.
 - 2. A specimen of PVC pipe 6 inches long shall be flattened between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is complete in 2 to 5 minutes.
 - 3. After being immersed for 2 hours in a sealed container of anhydrous acetone (99.5 percent pure), a sample ring of PVC pipe shall show no visible spalling or cracking when tested in accordance with ASTM D2152 (swelling or softening is not considered a failure).
- D. Drawings
 - 1. Submit Installation Drawings showing complete detail, both plan and side view details with proper layout and elevations.
 - 2. Submit As-Built Drawings for the complete sanitary sewer system showing complete detail with all dimensions, both above and below grade, including invert elevation.
 - 3. [Sign and seal As-Built Drawings by a Professional Surveyor and Mapper. Include the following statement: "All potable water lines crossed by sanitary hazard mains are in accordance with the permitted utility separation requirements."]

1.5 Delivery, Storage, and Handling

- A. Delivery and Storage

1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store [plastic piping, jointing materials, and] rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
 2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
 3. Cement, Aggregate, and Reinforcement: As specified in Section 03 30 00 – Cast In Place Concrete.
- B. Handling: Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. [Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs.] Carry, do not drag, pipe to trench.

Part 2 Products

2.1 Pipe

- A. Reinforced Concrete Gravity Pipe and Fittings
1. Pipe with an internal diameter of 12 inches or more; to be of reinforced concrete pipe conforming to the requirements of ASTM C76, Class III, IV, or V, with Wall Thickness B, unless otherwise authorized by the Engineer in writing, and as specified on the Drawings; circular concrete pipe with elliptical reinforcements not acceptable.
 2. Fittings and specials shall conform to the applicable requirements specified for the pipe and shall be of the same strength as the pipe.
 3. [Cement used in manufacturing pipe and fittings shall be [Type II] [Type V] [low alkali cement] conforming to ASTM C150/C150M.]
 4. Jointing Materials for Concrete Gravity Piping: Gaskets and pipe ends for rubber gasket joint shall conform to ASTM C443. Gaskets shall be suitable for use with sewage. Submit certificates of compliance stating that the fittings or gaskets used for waste drains or lines designated on the plans as [_____] are **[oil]** [_____] resistant.
- B. Clay
1. Extra strength sewer pipe **[bell-and-spigot piping only]** conforming to ASTM C700.
 2. Jointing materials shall comply with ASTM C425.

C. Polyvinyl Chloride (PVC)

1. To meet and/or exceed the requirements of ASTM D3034, SDR [35][26]; suitable for use as a gravity sewer conduit with provisions for contraction and expansion at each joint; with a rubber ring and standard lengths of 20 feet and 12.5 feet plus or minus 1 inch; designed to pass all tests at 73 degrees F (plus or minus 3 degrees F); 6 inch long sections of pipe to be subjected to impact from a free falling type (20 pounds, Type A) in accordance with ASTM D2444 with no evident splitting or shattering (denting not considered a failure); and with a minimum envelope of 4 inches of granular material around the pipe, but with all other bedding and backfilling requirements remaining the same as for other pipe material.
2. PVC Plastic Gravity Joints and Jointing Material: Joints shall conform to ASTM D3212. Gaskets shall conform to ASTM F477.

D. Ductile Iron

1. Ductile iron pipe shall conform to ASTM A746, Thickness Class [51][____]. Fittings shall conform to AWWA C110/A21.10 or AWWA C153/A21.53. **[Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, [except that the bell design shall be modified, as approved by the Engineer, for push-on joint].]** Fittings shall have strength at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the joints specified hereinafter. Pipe and fittings shall have cement-mortar lining conforming to AWWA C104/A21.4, standard thickness.
 - a. The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
 - b. Pipe and fittings shall be lined with Protecto 401, Tnemec Series 431, or Engineer-approved equal. The outside coating shall be manufacturer's standard asphaltic coating.
2. Ductile Iron Gravity Joints and Jointing Materials: Pipe and fittings shall have **[push-on joints] [or] [mechanical joints]**, except as otherwise specified in this paragraph. **[Mechanical joints only shall be used where indicated.] [Push-on joint pipe ends and fitting ends, gaskets, and lubricant for joint assembly shall conform to AWWA C111/A21.11.] [Mechanical joint requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA C111/A21.11.]**
3. The pipe manufacturer is to furnish the Engineer a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with ASTM A746. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the serial number of each piece of pipe making up the shipment. In addition, the weight of each individual piece of pipe making up the shipment is to be listed opposite the serial number of each pipe length and attached to the certificate of inspection.

- E. Lateral Branches: To be tees of the same material as the main sewer and have a 6 inch inside diameter unless otherwise specified or noted; able to withstand all test pressures involved without leakage.
- F. Piping Beneath Railroad Right-of-Way: Where pipeline passes under the right-of-way of a commercial railroad, piping shall conform to the specifications for pipelines conveying nonflammable substances in AREMA Eng. Man, except as otherwise specified in this paragraph. Ductile-iron pipe shall conform to and have strength computed in accordance with ASTM A746.

2.2 Concrete Materials

- A. Cement Mortar: Cement mortar shall conform to ASTM C270, Type M with Type II cement.
- B. Portland Cement: Submit certificates of compliance stating the type of cement used in manufacture of concrete pipe, fittings and precast manholes. Portland cement shall conform to ASTM C150/C150M, Type **III** **V** for concrete used in concrete pipe, concrete pipe fittings, and manholes and type optional with the Contractor for cement used in concrete cradle, concrete encasement, and thrust blocking. **[Air-entraining admixture conforming to ASTM C260/C260M shall be used with Type V cement.] [Where aggregates are alkali reactive, as determined by Appendix XI of ASTM C33/C33M, a cement containing less than 0.60 percent alkalis shall be used.]**
- C. Portland Cement Concrete: Portland cement concrete shall conform to ASTM C94/C94M, compressive strength of 4000 psi at 28 days, except for concrete cradle and encasement or concrete blocks for manholes. Concrete used for cradle and encasement shall have a compressive strength of 2500 psi minimum at 28 days. Concrete in place shall be protected from freezing and moisture loss for 7 days.

2.3 Manholes

- A. General: Manholes shall be cylindrical, with a 48" minimum inside diameter. Increase diameter as indicated on drawings. Provide [eccentric][concentric] cone top or flat top sections as required by manhole depth.
- B. Precast Concrete Manholes
 1. Precast concrete manhole risers, base sections, and tops shall conform to ASTM C478 [**; except that the minimum wall thickness shall be 6"**].
 2. Base and first riser shall be monolithic.
 3. The manhole sidewall shall be of a length such that a minimum of one course and a maximum of 2 courses of bricks shall be placed on top of the unit to bring the casting to grade. A precast concrete adjusting ring may be used for this purpose, conforming to the height ranges specified for brick.
 4. [Xypex Admix C-1000 or approved equal shall be used for all manholes. Xypex Admix or approved equal shall be added to the concrete mix at time of

batching. The manhole manufacturer shall submit specifications and the procedures for adding the Admix to the concrete. The admix shall have a red-tinted coloring.]

5. Coat interior with []
6. Precast manholes are to be manufactured by Cloud, Sherman Dixie or approved equal.
7. Plastic Gasket For Precast Manholes: Preformed plastic gasket shall meet or exceed all requirements of FS SS-S- 210-A, "Sealing Compound, Preformed Plastic for Pipe Joints," Type I, and ASTM C990, rope formed. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space when the manhole sections are installed. The sealing compound shall be protected by a suitable removable 2 piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. The flexible plastic gasket shall also meet the requirements of the following table:

Property	Test Method	Minimum	Maximum
Specific Gravity @ 77°F	ASTM D71	1.20	1.30
Ductility @ 77°F (5 cm/min)	ASTM D113	5.0	--
Softening Point (°F)	ASTM D36	320	--
Penetration @ 77°F (cm) (150 g-5 secs.)	ASTM D217	50	120

C. Glass-Fiber-Reinforced Polyester Manholes

1. Shall conform to ASTM D3753.
2. Manhole cylinders, man way reducers, and connectors shall be produced from glass fiber-reinforced polyester resin with the construction determined by the particular process of manufacture and configuration. The manhole shall provide an area from which a grade ring can be installed to accept a typical metal ring and cover and have the strength to support a traffic load without damage to the manhole.
 - a. Dimension: The manhole shall be a circular cylinder, reduced at the top to a circular man way not smaller than 22-1/2" inside diameter. Nominal inside diameter shall be 48 inches, or larger as shown on the drawings. Tolerance on the inside diameter shall be +/- 1%. The minimum wall thickness for all FRP manholes at all depths shall be 0.50 inches. The maximum vertical height of the cone shall be thirty six (36") inches.
 - b. Configuration: The cone must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade. The cone shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, this providing required monolithic design to prevent infiltration and/or exfiltration through the manhole.

- c. Class: The manhole shall be manufactured for a load rating suitable for an AASHTO H-20 wheel load.
 - d. Stub outs and Connections: Connections to manhole shall be made via installation of SDR PVC sewer pipe stub outs to manhole, or Kor-N-Seal boots. Installation of SDR PVC sewer pipe must be performed by sanding, priming, and using resin fiber-reinforced hand layup. The resin and fiberglass shall be same type and grade as used in the fabrication of the fiberglass manhole. Kor-N-Seal boots may be installed by manhole manufacturer using fiberglass reinforced pipe stub out for Kor-N-Seal boot sealing surface.
 - e. Manhole Bottom: Manholes shall have resin fiber-reinforced bottoms. Provide a minimum of two 1 ½ in. deep x 3 ½ in. wide stiffening ribs completely enclosed with resin fiber-reinforcement. Provide minimum 3 in. anti-flotation ring. Manhole bottom shall be a minimum of ½ inch thick.
 - f. Marking and Identification: All manholes shall be marked in letters no less than 1" in height with the following information:
 - 1) Manufacturer's name or trademark
 - 2) Manufacturer's factory location
 - 3) Manufacturer's serial number
 - 4) Manhole Length
 - 5) ASTM Designation
 - 6) Installation assists marks (vertical lines 90 deg. apart at base of manhole)
3. Quality Assurance/Quality Control
- a. Examination: Each manhole component part shall be examined for dimensional requirements.
 - b. Composition Control: Controls on glass and resin content shall be maintained for all manufacturing processes and for each portion of manhole fabrication. Records shall be maintained of these control checks. Proper glass content may be shown by glass usage checks, by glass and resin application rate checks, in accordance with the material composition test in ASTM D3753, paragraph 8.8.1.
 - c. All required ASTM D3753 testing shall be completed and records of all testing shall be kept and copies of test results shall be presented to Owner upon written request.
4. Materials

- a. **FRP Manholes:** All manholes shall be watertight. Glass-fiber reinforced polyester manholes shall be a one-piece monolithic designed unit constructed of glass-fiber reinforced, supplier certified, and unsaturated isophthalic polyester resin containing chemically enhanced silica to improve corrosion resistance, strength and overall performance. FRP manholes shall be manufactured in strict accordance with ASTM Da483753.
- b. **Exterior Surface:** For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added for a minimum thickness 0.125 in. or a UV inhibitor shall be added directly to the resin to prevent photo degradation. Mixing lots of resins from different manufacturers shall not be permitted.
- D. **Throat Rings:** Adjustment throat rings shall be precast non-reinforced concrete rings having a maximum thickness of two inches (2"). The internal diameter shall not be less than twenty-four inches (24"), and the width shall be a minimum of five inches (5"). No more than six throat rings shall be used on any manhole.
- E. **Initial Backfill Material (FRP Manholes):** The initial backfill material shall be composed of well graded, crushed stone or gravel conforming to the following requirements unless modified by the Engineer.

Crushed Stone or Gravel	Percent
Passing 1-1/2 inch sieve	100
Passing 1 inch sieve	95 to 100
Passing 3/8 inch sieve	25 to 60
Passing No. 4 sieve	0 to 10
Passing No. 8 sieve	0 to 5

- F. **Gaskets and Connectors:** Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923, and shall be Pelleborg Kor-N-Seal I with Korband Expander, or approved equal.
- G. **[External Preformed Rubber Joint Seals:** An external preformed rubber joint seal shall be an accepted method of sealing cast iron covers to precast concrete sections to prevent ground water infiltration into sewer systems. All finished and sealed manholes constructed in accordance with paragraph entitled "Manhole Construction" shall be tested for leakage in the same manner as pipelines as described in paragraph entitled "Leakage Tests." The seal shall be multi-section with a neoprene rubber top section and all lower sections made of Ethylene Propylene Diene Monomer (EPDM) rubber with a minimum thickness of 60 mils. Each unit shall consist of a top and bottom section and shall have mastic on the bottom of the bottom section and mastic on the top and bottom of the top section. The mastic shall be a non-hardening butyl rubber sealant and shall seal to the cone/top slab of the manhole/catch basin and over the lip of the casting. Extension sections shall cover up to two more adjusting rings. Properties and values are listed in the following table:

Properties, Test Methods and Minimum Values for Rubber used in Preformed Joint Seals]

Physical Properties	Test Methods	EPDM	Neoprene	Butyl Mastic
Tensile, psi	ASTM D412	1840	2195	
Elongation, %	ASTM D412	553	295	350
Tear Resistance, pli	ASTM D624 (Die B)	280	160	
Rebound, %, 5 minutes	ASTM C972 (mod.)			11
Rebound, %, 2 hours	ASTM C972			12

2.4 Metal Items

- A. Frames, Covers, and Gratings for Manholes: Frames and covers shall be ASTM A48, Class 30B cast iron or ductile iron, made accurately to the required dimensions; sound, smooth, clean, and free from blisters and other defects; not plugged or otherwise treated to remedy defects; machined so that covers rest securely in the frames with no rocking and are in contact with frame flanges for the entire perimeter of the contact surfaces; thoroughly cleaned subsequent to machining and before rusting begins; and with the actual weight in pounds stenciled or printed by the manufacturer on each casting in white paint. Castings shall be Deeter Foundry #1150, Neenah R-1642, or equal acceptable to Owner for traffic rated areas and Deeter Foundry #1158 for non-traffic rated areas or approved equal. Watertight castings shall be Neenah R-1642G, Deeter 1150/1155 with bolt down lid and gasket or approved equal. Refer to Standard Drawing. The frames and covers shall have a combined weight of not less than 400 pounds. The word "Sanitary Sewer" shall be stamped or cast into covers so that it is plainly visible.
- B. [Manhole Steps: [Zinc-coated steel] [as indicated] conforming to 29 CFR 1910.27. [As an option, plastic or rubber coating pressure-molded to the steel may be used. Plastic coating shall conform to ASTM D4101, copolymer polypropylene. Rubber shall conform to ASTM C443M ASTM C443, except shore A durometer hardness shall be 70 plus or minus 5.] Aluminum steps or rungs will not be permitted. Steps are not required in manholes less than 4 feet deep.]

2.5 Compression Couplings

- A. When dissimilar pipe materials like PVC and concrete pipe are joined, use compression couplings that are resistant to the corrosive action of soils and sewage and that will provide a permanent watertight joint. The compression couplings shall be of natural or synthetic rubber or rubber-like material and shall comply with the requirements and test methods specified in Table 2 of ASTM C425. The coupling shall meet the leak requirements specified in ASTM C425, and the bands for attaching the couplings to the dissimilar pipes shall be of stainless steel meeting ASTM A167 or A240. Each coupling shall bear the manufacturer's identifying mark and an indication of its size.

Part 3 Execution

3.1 Protection

- A. Carefully protect from damage all existing sewers, water lines, gas lines, sidewalks, curbs, gutters, pavements, electrical lines, and other utilities or structure in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility or structure in order to complete the work properly, do so in compliance with the provisions set forth in other sections of these specifications. Any such work shall be considered incidental to the construction of pipe sewers, and no additional payment will be allowed therefore.
- B. Water service connections that are damaged shall be repaired or replaced by the Contractor, in accordance with the Owner's Specifications.
- C. Service or house connections to existing sewers that are damaged or removed shall be repaired or replaced by the Contractor, in accordance with the Owner's Specifications.

3.2 Pipe Separation

- A. Lay sewers at least 10 feet horizontally from any existing or proposed water main. If this is not practical, the sewer may be laid closer than 10 feet to a water main provided it is laid in a separate trench and the elevation of the top of the sewer is at least 18 inches below the bottom of the water main.
- B. Where a sewer crosses under water mains, the top of the sewer shall be at least 18 inches below the bottom of the water main. If the elevation of the sewer cannot be varied to meet the above requirements, relocate the water main to provide this separation, or else reconstruct it with mechanical joint ductile iron pipe for a distance of 10 feet on each side of the sewer with a full joint of the water main centered over the sewer.
- C. If it is impossible to obtain proper horizontal and vertical separation as stipulated above, construct both the water main and the sewer of mechanical joint ductile iron pipe, and pressure test each.

3.3 Pipe Laying

- A. Lay no pipe except in the presence of Engineer or project representative representing the Owner.
- B. Before placing sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting or trench boxes as provided in Section 31 23 33 – Trenching and Backfilling
- C. Wherever necessary to provide satisfactory bearing surface, place concrete cradles as shown on the Drawings. Cradles shall be of concrete and conform to the dimensions shown on the Drawings. Concrete placed outside the dimensions shown shall be at the Contractor's expense.

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- D. Lasers shall be used to set line and grade, after the type and procedures are approved by the Engineer. Set reference points for both line and grade at each manhole. Where grades are 0.6 percent or less, check the elevation of the beam each 100 feet with an offset point or engineer's level.
- E. Do not allow water to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to dewater.
- F. Correct trench bottoms found to be unsuitable for foundations after pipe laying operations have started, bringing them to exact line and grade with compacted earth or stone as necessary.
- G. Special Requirements:
1. Installation of Clay Piping: Install pipe and fittings in accordance with this section and with the requirements of ASTM C12 for pipe laying. Make joints with a compression joint material specified for clay pipe joints and assemble in accordance with the recommendations of the manufacturer of the pipe.
 2. Installation of Concrete Gravity Sewer Piping: Install pipe and fittings in accordance with this section and with the provisions for rubber gasket jointing and jointing procedures of ACPA 01-103 or of ACPA 01-102, Chapter 9, "Installation, Inspection and Construction Testing." Make joints with the gaskets specified for concrete gravity sewer pipe joints. Clean and dry surfaces receiving lubricants, cements, or adhesives. Affix gaskets to pipe not more than 24 hours prior to the installation of the pipe. Protect gaskets from sun, blowing dust, and other deleterious agents at all times. Before installation of the pipe, inspect gaskets and remove and replace loose or improperly affixed gaskets. Align each pipe section with the previously installed pipe section, and pull the joint together. If, while pulling the joint, the gasket becomes loose and can be closure, remove the pipe and remake the joint.
 3. Installation of Ductile Iron Gravity Sewer Pipe: Unless otherwise specified, install pipe and associated fittings in accordance with this section and with the requirements of AWWA C600 for pipe installation and joint assembly.
 - a. [Make push-on joints with the gaskets and lubricant specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly.] [Make mechanical-joints with the gaskets, glands, bolts, and nuts specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.]
 - b. Exterior protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet in accordance with AWWA C105/A21.5, using [Class A] [Class C] polyethylene film.

4. Installation of PVC Plastic Piping: Install pipe and fittings in accordance with this section and with the requirements of ASTM D2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
- H. Carefully inspect each piece of pipe and special fitting before it is placed, and lay no defective pipe in the trench. Pipe-laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe-laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.
- I. Bell holes shall be large enough to allow ample room for the pipe joints to be properly made. Cut out the bell holes no more than 2 joints ahead of the pipe laying. Carefully grade the bottom of the trench between bell holes so that each pipe barrel rests on a solid foundation for its entire length. Lay each pipe joint so as to form a close concentric joint with adjoining pipe and to avoid sudden offsets or inequalities in the flow line.
- J. Install tee branches in sewer lines to serve properly each lot facing or abutting on the street or alley in which sewer is being laid. If tee branches are not to be used immediately, close them with approved stopper that are held in place to prevent infiltration and withstand all test requirements.
- K. For all tees that are plugged and laid in rock, blast a minimum of 6 LF of ditch line in the direction and to the approximate grade of the future lateral, but do not excavate the material. This shall be done at no extra cost to the Owner. Furnish the Owner with a record of the exact location of each tee installed.
- L. If the work consists of constructing a new sewer to replace an existing one, connect only existing active service lines to the new line, unless directed otherwise by the Owner.
- M. New service laterals shall conform to the standard drawings.
- N. As the work progresses, thoroughly clean the interior of the pipe in place. After each line of pipe has been laid, carefully inspect it, and remove all earth, trash, rags, and other foreign matter from its interior.
- O. After the joints have been completed, they shall be inspected, tested, and accepted by the Owner's Representative before being covered. The pipe shall meet the test requirements for watertightness; immediately repair any leak or defect discovered at any time after completion of the work. Any pipe that has been disturbed after joints were formed shall be taken up, the joints cleaned and remade, and the pipe relaid at the Contractor' expense. Carefully protect all pipe in place from damage until backfilling operations are completed.
- P. Do not begin the backfilling of trenches until the pipe in place has been reviewed and approved by the Owner's Representative.

- Q. Make connections to all existing active sewer lines as shown on the Drawings. Make connections either by removing a section of the sewer from the existing line and inserting a wye or tee branch of the proper size or by constructing a manhole, junction box, regulator chamber, or other structure as shown on the Drawings.
- R. Make connections to existing manholes or inlets by cutting a hole in the wall of the existing structure, inserting a length of sewer pipe into the hole, filling around the pipe with concrete or mortar, and troweling the inside and outside surfaces of the joint to a neat finish. Shape or reshape the bottom of the manholes as necessary to fit the invert of the sewer pipe.
- S. Joint dissimilar pipe by using suitable compression couplings. If compression couplings are not available, make jointing with a special fabricated coupling approved by the Owner.
- T. Provide concrete protection or concrete cap as shown on the Drawings for pipe sewers that, when completed, have less than 2.5 feet of covering in nontraffic areas and 4 feet of cover in traffic areas. [If such protection is not shown on the Drawings, place it in accordance with the typical section shown.]
- U. Existing water service connections which are damaged by the Contractor will be repaired or replaced at his expense as an incidental part of the work.
- V. Existing service or house connections to existing sewers that are damaged or removed shall be repaired or replaced by the Contractor at his own expense as an incidental part of the work.

3.4 Concrete Work

- A. Cast-in-place concrete is included in Section 03 30 00 – Cast In Place Concrete. The pipe shall be supported on a concrete cradle, or encased in concrete where indicated on the drawings or directed by the Engineer.

3.5 Manhole Construction – General

- A. Dewater sufficiently to maintain the ground water level at or below the bottom of the manhole foundation prior to and during placement of the foundation.
- B. Obtain an adequate foundation for all manhole structures by removing and replacing unsuitable material with well graded granular material, by tightening with coarse rock, or by such other means as provided for foundation preparation of the connected sewers or as directed by the Engineer. Wherever water is encountered at the site, place all cast-in-place bases on a one-piece waterproof membrane to prevent any movement of water into the fresh concrete.
- C. Carefully set the cast iron frame and cover at the required elevation, and properly bond it to the masonry with preformed plastic gasket or cement grout. Wherever manholes are constructed in paved areas, tilt the top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the existing adjacent pavement. Wherever manholes are constructed in new subdivision streets, set the

top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the proposed finished surface.

- D. Where the difference in the invert elevation of two or more sewers intersecting in one manhole is 24 inches or more, construct a drop manhole. Drop manholes shall be similar in construction to standard manholes except that a drop connection of pipe and fittings of the proper sizes and materials shall be constructed outside the manhole and supported by 4,000 psi concrete as indicated by the Standard Details.

3.6 Concrete/Precast Manhole Construction

- A. Construct base slab of cast-in-place concrete or use precast concrete base sections. For cast-in-place manhole bases, carefully block the lower barrel section above the prepared surface so that it is fully and uniformly supported in true alignment; make sure that all entering pipe can be inserted at proper grade. Then place the concrete foundation and invert under and upon this base section as shown in the standard drawings. For monolithic manhole bases, carefully level the base stone and place the base section on this prepared base so it is fully and uniformly supported in true alignment and elevation.
- B. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semi-circular bottom conforming to the inside contour of the adjacent sewer sections. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit.
- C. No parging will be permitted on interior manhole walls.
- D. For precast concrete construction, make joints between manhole sections with the gaskets specified for this purpose; install in the manner specified for installing joints in concrete piping. Parging will not be required for precast concrete manholes.
- E. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled "Concrete Work" of this section.
- F. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer.
- G. Thoroughly wet and then completely fill all lift holes with mortar. Trim all protruding mastic between precast elements and between the manhole casting and the manhole riser on the inside of the manhole and smooth over these joints with mortar.
- H. Where a new manhole is constructed on an existing line, remove existing pipe as necessary to construct the manhole. Cut existing pipe so that pipe ends are approximately flush with the interior face of manhole wall, but not protruding into the manhole. Use resilient connectors as previously specified for pipe connectors to concrete manholes.

- I. Place backfill by hand around the manhole and to a distance of at least one pipe length into each trench, and tamp the downstream side with clean 1/2 inch to 3/4 inch crushed stone up to an elevation of 12 inches above the crown on all entering pipes. Continue backfilling in accordance with the requirements for trench backfilling.

3.7 FRP Manhole Construction

- A. Manholes shall be constructed of materials and workmanship as prescribed by these specifications, at such places shown on the plans and in conformity with the typical details.
- B. Fiberglass manholes must be installed according to manufacturer installation instructions. In addition to these instructions, local codes may apply and should be consulted as applicable in manhole installation.
- C. Excavation at manhole location should be at least wide enough to accommodate the slab specified and to provide working room around manhole. Ensure the depth of manhole is sufficient to allow at least two concrete rings for adjustment of ring and cover at top of final grade.
- D. Manhole Base: Use initial backfill material to provide 4 to 6 inches of leveling base.
- E. Setting Manhole: To lift manhole, insert 4" x 4" timber crosswise inside the manhole to the underside of the collar with a rope or woven fabric slings attached to backhoe or other lifting device and lower the manhole. Level manhole and connect sewer lines to manhole. A concrete base encasement shall be placed at least 12 inches from the manhole and shall come over the top of the anti-flotation ring a minimum of 12 inches.
- F. Invert and Bench Area: The invert and bench area can be formed with wet concrete and finished with an epoxy sealant.
- G. Backfill Material: Initial backfill material shall be used for backfill around the manhole for a minimum distance of one foot from the outside surface and extending from the bottom of the excavation to the top of the reducer section. Secondary backfill material may be used for the remainder of the backfill. This material will be subject to approval by Engineer.
- H. Backfill Procedure: Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to 95% Standard Proctor Density, unless otherwise approved by Engineer. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the fiberglass manhole structure.

3.8 Field Quality Control – Sewer Lines

- A. Before constructing or placing any joints, demonstrate to the Owner's Representative, by completing at least 1 sample joint, that the methods to be used conform to the specifications and will provide a watertight joint and further that the

workmen to be involved in this phase of work are thoroughly familiar with experienced with the type of joint proposed.

B. No other type of joint may be used unless authorized in writing by the Owner.

C. Testing Of Gravity Sewers

1. Visual Tests

a. Upon completion of the construction or earlier if the Owner's Representative deems advisable, the Owner's Representative will make a visual inspection of the sewer and construction site. Immediately repair all leaks and defects found by such inspection.

b. In addition to general cleanup and leakage, the following standard shall be used to determine failure or defects of this project. Sewers shall be built so as to remain true to line and grade. The inclining grade of the bottom of the sewer after completion shall be such that no remaining puddle of water is deeper than 1/2 inch on pipe 36 inches internal diameter or smaller and 3/4 inch on pipe larger than 36 inches internal diameter. Any section of pipe that does not comply with the specifications at any time previous to final acceptance of the work shall be replaced or relaid at the Contractor's expense.

c. The Contractor will be held strictly responsible that all parts of the work bear the load of the backfill. If defects develop in the pipe within 1 year from the date of final acceptance of the work, the Contractor will be required to replace, at his expense, all such cracked pipe. To this end, the Contractor is advised to purchase pipe under a guarantee from the manufacturer, guaranteeing proper service of sewer pipe under conditions established by the Drawings, specifications, and local conditioning at the site of the work.

2. Leakage Tests: Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C969. Make calculations in accordance with the Appendix to ASTM C969.

b. Low pressure air tests: Perform low pressure air testing as follows:

- 1) Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the Owner.
 - 2) Perform the first series of air tests after 2,000 LF but before 4,000 LF of sewer has been laid. The purpose of this first series of tests is to assure both the Contractor and the Owner that the materials and method of installation meet the intent of these specifications. Conduct the remainder of the tests after approximately each 10,000 LF has been laid.
 - 3) Plug all tees and ends of sewer services with flexible joint plugs or caps securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.
 - 4) Prior to testing, check the pipe to see that it is clean. If not, clean it by passing a full-gauge squeegee through the pipe. It shall be the Contractor's responsibility to have the pipe cleaned.
 - 5) Clay pipelines: Test in accordance with ASTM C828. Allowable pressure drop shall be as given in ASTM C828. Make calculations in accordance with the Appendix to ASTM C828.
 - 6) Concrete pipelines: Test in accordance with ASTM C924. Allowable pressure drop shall be as given in ASTM C924. Make calculations in accordance with the Appendix to ASTM C924.
 - 7) Ductile Iron pipelines: Test in accordance with ASTM C924. Allowable pressure drop shall be as given in ASTM C924. Make calculations in accordance with the Appendix to ASTM C924.
 - 8) PVC plastic pipelines. Test in accordance with UBPPA Uni-B-6. Allowable pressure drop shall be as given in UBPPA Uni-B-6. Make calculations in accordance with the Appendix to UBPPA Uni-B-6.
3. Deflection Testing: Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of the pipe. Determine whether the allowable deflection has been exceeded by the use of a pull-through device or a deflection measuring device.
- a. Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter

of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:

- 1) A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.
 - 2) Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 40 degrees F, and shall have a surface Brinell hardness of not less than 150.
 - 3) Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.
 - 4) Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.
- b. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.
- c. Pull-through device procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.
- d. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.
- D. Visual Inspection of Miscellaneous Materials: All material used on this project are subject to visual inspection by the Owner's Representative at the site for conformance to the required specifications. When reasonable doubt exists that said material meets the specifications, the Owner's Representative may require certified mill tests, samples, and/or tests by an independent laboratory or other suitable form of verification that the material meets the required specifications.
- E. Field Tests for Concrete: Field testing requirements are covered in Section 03 30 00 Cast-In-Place Concrete.

3.9 Field Quality Control - Manholes

- A. All manholes are to be vacuum tested immediately after assembly or construction and before backfilling. No standing water shall be allowed in the manhole excavation which may affect the accuracy of the test.
- B. All pipe and other openings into the manhole shall be suitably plugged in such a manner as to prevent displacement of the plugs while the vacuum is pulled. Service lines at manholes may be vacuum tested in lieu of air testing at the option of the Contractor.
- C. The Contractor is required to furnish all equipment necessary for these tests including the manhole sealing apparatus, gauges, pump plugs, and personnel shall be in accordance with equipment specifications and instructions provided by the manufacturer.
- D. The test head shall be placed in the cone section of the manhole.
- E. A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches of mercury shall be recorded.
- F. Acceptance for 4 foot diameter manholes shall be defined as when the time to drop to 9 inches of mercury meets or exceeds the following:

Manhole Depth	Diameter	Time to Drop 1 Inch HG
10 ft. or less	4 ft.	75 seconds
10 ft. to 15 ft.	4 ft.	90 seconds
15 ft. to 25 ft.	4 ft.	105 seconds

- G. For manholes 5 foot in diameter, add an additional 15 seconds and for manholes 6 foot in diameter, add an additional 30 seconds to the time requirements for 4 foot diameter manholes.
- H. If the manhole fails the test, necessary repairs shall be made and the vacuum test repeated until the manhole passes the test.
- I. If the manhole joint mastic is displaced enough to leave a void between the sections during the vacuum test, the manhole shall be disassembled and the seal replaced.
- J. A second vacuum test will be required after the manhole casting has been set and the binder placed around it.
- K. Regardless of the outcome of the vacuum tests, any visual or audio defects are to be repaired.

3.10 Cleanup

- A. After completing each section of the sewer line, remove all debris, construction materials, and equipment from the site 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.

END OF SECTION

Part 1 General

1.1 Section Includes

- A. Furnish and install storm drainage facilities including drain piping, fittings, accessories and bedding; catch basins; manholes and other facilities.

1.2 Related Sections

- A. Section 31 20 00 – Earth Moving
- B. Section 31 23 33 – Trenching and Backfilling

1.3 Measurement and Payment

A. Pipe Culverts and Storm Drains:

- 1. The length of pipe installed will be measured along the centerlines of the pipe from end to end of pipe without deductions for diameter of manholes. Pipe will be paid for at the contract unit price for the number of linear feet of culverts or storm drains placed in the accepted work.

B. Storm Drainage Structures:

- 1. The quantity of manholes and inlets will be measured as the total number of manholes and inlets of the various types of construction, complete with frames and gratings or covers and, where indicated, with fixed side-rail ladders, constructed to the depth of [__] feet in the accepted work.
- 2. The depth of manholes and inlets will be measured from the top of grating or cover to invert of outlet pipe.
- 3. Manholes and inlets constructed to depths greater than the depth specified above will be paid for as units at the contract unit price for manholes and inlets, plus an additional amount per linear foot for the measured depth beyond a depth of [__] feet.

C. Walls and Headwalls

- 1. Walls and headwalls will be measured by the number of cubic yards of reinforced concrete, plain concrete, or masonry used in the construction of the walls and headwalls.
- 2. Wall and headwalls will be paid for at the contract unit price for the number of walls and headwalls constructed in the completed work.

D. Flared End Sections

Storm Drainage Utilities

1. Flared end sections will be measured by the unit.
2. Flared end sections will be paid for at the contract unit price for the various sizes in the accepted work.

E. Sheeting and Bracing

1. Payment will be made for that sheeting and bracing ordered to be left in place, based on the number of square feet of sheeting and bracing remaining below the surface of the ground.

F. Rock Excavation

1. Payment will be made for the number of cubic yards of material acceptably excavated, as specified and defined as rock excavation in [Section 31 20 00 Earthwork], measured in the original position, and computed by allowing actual width of rock excavation with the following limitations:
 - a. Maximum rock excavation width, 30 inches for pipe of 12 inch or less nominal diameter;
 - b. Maximum rock excavation width, 16 inches greater than outside diameter of pipe of more than 12 inch nominal diameter.
 - c. Measurement will include authorized overdepth excavation.
 - d. Payment will also include all necessary drilling and blasting, and all incidentals necessary for satisfactory excavation and disposal of authorized rock excavation.
 - e. No separate payment will be made for backfill material required to replace rock excavation; this cost shall be included in the Contractor's unit price bid per cubic yard for rock excavation.
 - f. In rock excavation for manholes and other appurtenances, 1 foot will be allowed outside the wall lines of the structures.

G. Backfill Replacing Unstable Material

1. Payment will be made for the number of cubic yards of select granular material required to replace unstable material for foundations under pipes or drainage structures, which will constitute full compensation for this backfill material, including removal and disposal of unstable material and all excavating, hauling, placing, compacting, and all incidentals necessary to complete the construction of the foundation satisfactorily.

H. Pipe Placed by Jacking

1. Payment will be made for the number of linear feet of jacked pipe accepted in the completed work measured along the centerline of the pipe in place.

1.4 Submittals

- A. Submit the following in accordance with Section 01 33 00 - Submittal Procedures:
- B. Action Submittals:
 - 1. Shop Drawings: Indicate openings in inlets and junction boxes, inverts and sizes. Indicate grating type and installation.
 - 2. Product data: Provide product data for precast structures, pipe, and pipe accessories.
- C. Informational Submittals:
 - 1. Product Data Placing Pipe: Submit printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.
 - 2. Manufacturer's Certificate: Certify that products meet or exceed applicable state DOT requirements.

1.5 Delivery, Storage, and Handling

- A. Delivery and Storage
 - 1. Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling.
 - 2. Materials shall not be stored directly on the ground.
 - 3. The inside of pipes and fittings shall be kept free of dirt and debris.
 - 4. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material.
 - 5. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Engineer.
 - 6. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.
- B. Handling
 - 1. Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition.

2. Pipe shall be carried to the trench, not dragged.

Part 2 Products

2.1 Pipe for Culverts and Storm Drains

- A. Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

2.2 Round Concrete Pipe

- A. Manufactured in accordance with and conforming to AASHTO M 170, Class [II] [III] [IV] [V], as modified in [_____][Section 850.01(a) of the ADOT Standard Specifications for Highway Construction.] [Section 843.2.01 of the GDOT Standard Specifications.] [Section 850.01(a) of the ADOT Standard Specifications for Highway Construction.] [Section 850.01(a) of the ADOT Standard Specifications for Highway Construction.]

- B. Gaskets:

1. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe. The rubber-type gaskets shall conform to AASHTO M 198, with the additional requirement that they shall be of sufficient volume to fill the pipe joint space. Gaskets shall have not more than one factory-fabricated splice.
2. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of AASHTO M 198. Certified copies of test results shall be delivered to the Engineer before gaskets or jointing materials are installed.

2.3 Reinforced Arch Culvert and Storm Drainpipe

- A. Manufactured in accordance with and conforming to AASHTO M 206, Class [A-II] [A-III] [A-IV].
- B. Joint Sealing Materials: Flexible watertight joints shall be made with bituminous plastic cement conforming to ASTM C990.

2.4 Corrugated Steel Pipe

- A. Fully Bituminous Coated

1. AASHTO M 190 Type A and AASHTO M 36 zinc or aluminum (Type 2) coated pipe of Type IR pipe with helical 3/4 by 3/4 by 7-1/2 inch corrugations.

- B. Fully Bituminous Coated, Part Paved

1. AASHTO M 190 Type C and AASHTO M36 zinc or aluminum (Type 2) coated

Type [I] [III] pipe with helical 2-2/3 by 1/2 inch corrugations.

C. Concrete-Lined

1. AASHTO M 36 zinc coated Type I corrugated steel pipe with helical 2-2/3 by 1/2 inch corrugations, exterior bituminous coating, and a concrete lining in accordance with [ASTM A849][Section 850.02(c)(4) of the ALDOT Standard Specifications for Highway Construction].

D. Polymer Precoated

1. AASHTO M 245 corrugated steel pipe fabricated from AASHTO M 246 Grade 250/250 10/10 polymer precoated sheet of Type IR pipe with helical 3/4 by 3/4 by 7-1/2 inch corrugations.

E. Connecting Bands:

1. Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded.
2. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.
3. Connecting bands shall be made of material conforming to AASHTO M 218 or to AASHTO M 274 depending on the type of metallic coat on the pipe. All bands shall have a minimum of two circumferential corrugations which shall effectively engage the second, as a minimum, circumferential corrugated valley from the end of each pipe. Connecting bands shall be no more than three nominal sheet thicknesses lighter than the thickness of the pipe to be connected but in no case lighter than 17 gage.
4. Bolts and nuts for connecting bands, furnished in sufficient sizes and numbers to adequately perform the intended function, shall conform to the requirements of ASTM A 307. Band connection hardware consisting of bolts, nuts, bars, and rivets shall be galvanized in accordance with the requirements of AASHTO M 232 or be coated by the electroplating process as provided in ASTM B633 Class Fe/Zn 8.
5. Protective coatings for connecting bands shall be the same as used on the pipes which are being connected.

2.5 Corrugated Aluminum Alloy Pipe

- A. AASHTO M 196 corrugated aluminum alloy pipe conforming to Section 850, ALDOT Standard Specifications for Highway Construction.
- B. Connecting Bands: The width and design of connection bands shall be as noted in AASHTO M 196 with the pitch and depth of corrugations, etc. consistent with the

type corrugations of the pipe being used. Bituminous coating for use with bituminous coated pipe and pipe arches shall conform to the appropriate requirements of AASHTO M 190.

2.6 Structural Plate, Steel Pipe, Pipe Arches and Arches

- A. Assembled with galvanized steel nuts and bolts, from galvanized corrugated steel plates conforming to AASHTO M 167.
- B. Pipe coating shall conform to the requirements of [AASHTO M 190 Type A] [AASHTO M 243]. Thickness of plates shall be as indicated.
- C. Connecting Bands:
 - 1. Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded.
 - 2. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.
 - 3. Connecting bands shall be made of material conforming to AASHTO M 218 or to AASHTO M 274 depending on the type of metallic coat on the pipe. All bands shall have a minimum of two circumferential corrugations which shall effectively engage the second, as a minimum, circumferential corrugated valley from the end of each pipe. Connecting bands shall be no more than three nominal sheet thicknesses lighter than the thickness of the pipe to be connected but in no case lighter than 17 gage.
 - 4. Bolts and nuts for connecting bands, furnished in sufficient sizes and numbers to adequately perform the intended function, shall conform to the requirements of ASTM A307. Band connection hardware consisting of bolts, nuts, bars, and rivets shall be galvanized in accordance with the requirements of AASHTO M 232 or be coated by the electroplating process as provided in ASTM B 633 Class Fe/Zn 8.
 - 5. Protective coatings for connecting bands shall be the same as used on the pipes which are being connected.

2.7 Structural Plate, Aluminum Pipe, Pipe Arches and Arches

- A. Assembled with either aluminum alloy, aluminum coated steel, stainless steel or zinc coated steel nuts and bolts. Nuts and bolts, and aluminum alloy plates shall conform to AASHTO M 219.
- B. Pipe coating, when required, shall conform to the requirements of [AASHTO M 190, Type A] [AASHTO M 243].
- C. Thickness of plates shall be as indicated.

- D. Connecting Bands: The width and design of connection bands shall be as noted in AASHTO M 196 with the pitch and depth of corrugations, etc. consistent with the type corrugations of the pipe being used. Bituminous coating for use with bituminous coated pipe and pipe arches shall conform to the appropriate requirements of AASHTO M 190.

2.8 Perforated Piping

- A. Polyvinyl Chloride (PVC) Pipe: ASTM D2729.

2.9 PVC Pipe

- A. Submit the pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, prior to installation of the pipe.
- B. Type PSM PVC Pipe: ASTM D3034, Type PSM, maximum SDR 35, produced from PVC certified by the compounder as meeting the requirements of ASTM D1784, minimum cell class 12454-B.
- C. Corrugated PVC Pipe: ASTM F949 produced from PVC certified by the compounder as meeting the requirements of ASTM D1784, minimum cell class 12454-B.
- D. Joints shall be solvent cement or elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

2.10 Polyethylene (PE) Pipe

- A. Submit the pipe manufacturer's resin certification, indicating the cell classification of PE used to manufacture the pipe, prior to installation of the pipe. The minimum cell classification for polyethylene plastic shall apply to each of the seven primary properties of the cell classification limits in accordance with ASTM D3350.
- B. Corrugated PE Pipe
 - 1. AASHTO M 294, Type S. For slow crack growth resistance, acceptance of resins shall be determined by using the notched constant ligament-stress (NCLS) test meeting the requirements of AASHTO M 294. Pipe walls shall have the following properties:

Nominal Size (inch)	Minimum Wall Area (square in/ft)	Minimum Moment of Inertia of Wall Section (in. to the 4th/in.)
12	1.5	0.024
15	1.91	0.053
18	2.34	0.062

Storm Drainage Utilities

24	3.14	0.116
30	3.92	0.163
36	4.50	0.222
42	4.69	0.543
48	5.15	0.543
54	5.67	0.800
60	6.45	0.800

- C. Pipe joints shall be [soil] [silt] [water] tight and shall conform to the requirements in AASHTO M 294. [Water tight joints shall be made using a PE coupling and rubber gaskets as recommended by the pipe manufacturer. Rubber gaskets shall conform to ASTM F477.]

2.11 Drainage Structures

- A. Flared End Sections: Sections shall be of a standard design fabricated from zinc coated steel sheets meeting requirements of ASTM A929/A929M.
- B. Precast Reinforced Concrete Box: Manufactured in accordance with and conforming to ASTM C1433.

2.12 Miscellaneous Materials

A. Concrete

1. Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for [___] psi concrete under Section [03 30 00 - Cast-In-Place Concrete]. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C231. The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground.
2. Expansion-joint filler material shall conform to ASTM D1751, or ASTM D1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D1752.

- B. Mortar: Mortar for connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar but in no case shall exceed [___] gallons

of water per sack of cement. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

- C. Brick: Brick shall conform to ASTM C62, Grade SW; ASTM C55, Grade S-I or S-II; or ASTM C32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 13 mm 1/2 inch of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.
- D. Precast Reinforced Concrete Manholes
1. Conform to ASTM C478. Joints between precast concrete risers and tops shall be [full-bedded in cement mortar and shall be smoothed to a uniform surface on both interior and exterior of the structure] [made with flexible watertight, rubber-type gaskets].
- E. Frame and Cover for Gratings
1. Submit certification on the ability of frame and cover or gratings to carry the imposed live load.
 2. Frame and cover for gratings shall be cast gray iron, AASHTO M105, Class A; or cast ductile iron, ASTM A536, Grade 65-45-12. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. The word "Storm Sewer" shall be stamped or cast into covers so that it is plainly visible.
- F. Flap Gates: Flap Gates shall be [medium] [or] [heavy]-duty with [circular] [rectangular] opening and double-hinged. [Top pivot points shall be adjustable.] The seat shall be one-piece cast iron with a raised section around the perimeter of the waterway opening to provide the seating face. The seating face of the seat shall be [cast iron] [bronze] [stainless steel] [neoprene]. The cover shall be one-piece cast iron with necessary reinforcing rib, lifting eye for manual operation, and bosses to provide a pivot point connection with the links. The seating face of the cover shall be [cast iron] [bronze] [stainless steel] [neoprene]. Links or hinge arms shall be cast or ductile iron. Holes of pivot points shall be bronze bushed. All fasteners shall be either galvanized steel, bronze or stainless steel.

2.13 Steel Ladder

- A. Steel ladder shall be provided where the depth of the storm drainage structure exceeds 12 feet. These ladders shall be not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders and inserts shall be galvanized after

fabrication in conformance with ASTM A123.

2.14 Downspout Boots

- A. Boots used to connect exterior downspouts to the storm-drainage system shall be of gray cast iron conforming to ASTM A48, Class 30B or 35B. Shape and size shall be as indicated.

2.15 Resilient Connectors

- A. Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C923.

2.16 Hydrostatic Test On Watertight Joints

- A. Concrete, PVC, and PE Pipe: A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and non-reinforced concrete pipe shall conform to ASTM C990 or ASTM C443. Test requirements for joints in PVC and PE plastic pipe shall conform to ASTM D3212.
- B. Corrugated Steel and Aluminum Pipe
 - 1. A hydrostatic test shall be made on the watertight joint system or coupling band type proposed. The moment strength required of the joint is expressed as 15 percent of the calculated moment capacity of the pipe on a transverse section remote from the joint by the AASHTO HB-17 (Division II, Section 26).
 - a. The pipe shall be supported for the hydrostatic test with the joint located at the point which develops 15 percent of the moment capacity of the pipe based on the allowable span in feet for the pipe flowing full or 40,000 foot-pounds, whichever is less.
 - b. Performance requirements shall be met at an internal hydrostatic pressure of 10 psi, for a 10 minute period for both annular corrugated metal pipe and helical corrugated metal pipe with factory reformed ends.

2.17 Erosion Control Riprap

- A. Provide nonerodible rock not exceeding 15 inches in its greatest dimension and choked with sufficient small rocks to provide a dense mass with a minimum thickness of [8 inches] [as indicated].

Part 3 Execution

3.1 Excavation for Pipe Culverts, Storm Drains, and Drainage Structures

- A. Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of [Section 31 20 00 - Earthwork][_____] and the requirements specified below.
- B. Trenching
 - 1. The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus [_____] inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation.
 - 2. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Owner.
- C. Removal of Rock
 - 1. Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe.
 - 2. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe.
 - 3. Rock excavation shall be as specified and defined in [Section 31 20 00 - Earthwork][_____].
- D. Removal of Unstable Material
 - 1. Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Engineer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING.
 - 2. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Owner.

3.2 Bedding

- A. The bedding surface for the pipe shall provide a firm foundation of uniform density

throughout the entire length of the pipe.

B. Concrete Pipe Requirements

1. When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in granular material minimum 4 inch in depth in trenches with soil foundation. Depth of granular bedding in trenches with rock foundation shall be 1/2 inch in depth per foot of depth of fill, minimum depth of bedding shall be 8 inch up to maximum depth of 24 inches.
2. The middle third of the granular bedding shall be loosely placed.
3. Bell holes and depressions for joints shall be removed and formed so entire barrel of pipe is uniformly supported. The bell hole and depressions for the joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

C. Corrugated Metal Pipe

1. Bedding for corrugated metal pipe and pipe arch shall be in accordance with ASTM A798. It is not required to shape the bedding to the pipe geometry. However, for pipe arches, either shape the bedding to the relatively flat bottom arc or fine grade the foundation to a shallow v-shape. Bedding for corrugated structural plate pipe shall meet requirements of ASTM A807.

- D. Plastic Pipe: Bedding for PVC and PE pipe shall meet the requirements of ASTM D2321. Use Class IB or II material for bedding, haunching, and initial backfill.

3.3 Placing Pipe

- A. Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements.
- B. Pipelines shall be laid to the grades and alignment indicated.
- C. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe.
- D. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.
- E. Deflection of installed flexible pipe shall not exceed the following limits:

TYPE OF PIPE	MAXIMUM ALLOWABLE DEFLECTION (percent)
Corrugated Steel and Aluminum Alloy	5

Concrete-Lined Corrugated Steel	3
Plastic (PVC, HDPE)	5

- F. Note post installation requirements of paragraph DEFLECTION TESTING in PART 3 of this specification for all pipe products including deflection testing requirements for flexible pipe.
- G. Concrete and PVC Pipe: Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.
- H. PE Pipe: Laying shall be with the separate sections joined firmly on a bed shaped to line and grade and shall follow manufacturer's guidelines.
- I. Corrugated Metal Pipe and Pipe Arch:
 - 1. Laying shall be with the separate sections joined firmly together, with the outside laps of circumferential joints pointing upstream, and with longitudinal laps on the sides.
 - 2. Part paved pipe shall be installed so that the centerline of bituminous pavement in the pipe, indicated by suitable markings on the top at each end of the pipe sections, coincides with the specified alignment of pipe.
 - 3. Fully paved steel pipe or pipe arch shall have a painted or otherwise applied label inside the pipe or pipe arch indicating sheet thickness of pipe or pipe arch.
 - 4. Any unprotected metal in the joints shall be coated with bituminous material as specified in AASHTO M 190 or AASHTO M 243.
 - 5. Interior coating shall be protected against damage from insertion or removal of struts or tie wires.
 - 6. Lifting lugs shall be used to facilitate moving pipe without damage to exterior or interior coatings.
 - 7. During transportation and installation, pipe or pipe arch and coupling bands shall be handled with care to preclude damage to the coating, paving or lining.
 - 8. Damaged coatings, pavings and linings shall be repaired in accordance with the manufacturer's recommendations prior to placing backfill. Pipe on which coating, paving or lining has been damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced.
 - 9. Vertical elongation, where indicated, shall be accomplished by factory elongation. Suitable markings or properly placed lifting lugs shall be provided to ensure placement of factory elongated pipe in a vertical plane.
- J. Multiple Culverts

1. Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 1 meter 3 feet apart, whichever is less.
- K. Jacking Pipe Through Fills: Methods of operation and installation for jacking pipe through fills shall conform to requirements specified in Volume 1, Chapter 1, Part 4 of AREMA Eng Man.

3.4 Jointing

A. Concrete Pipe

1. Flexible Watertight Joints: Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.
2. External Sealing Band Joint for Noncircular Pipe: Surfaces to receive sealing bands shall be dry and clean. Bands shall be installed in accordance with manufacturer's recommendations.

B. Corrugated Metal Pipe

1. Flexible Watertight, Gasketed Joints: Installation shall be as recommended by the gasket manufacturer for use of lubricants and cements and other special installation requirements. The gasket shall be placed over one end of a section of pipe for half the width of the gasket. The other half shall be doubled over the end of the same pipe. When the adjoining section of pipe is in place, the doubled-over half of the gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so that the gasket covers the end of pipe sections equally.
2. Connecting bands shall be centered over adjoining sections of pipe, and rods or bolts placed in position and nuts tightened.
3. Band Tightening: The band shall be tightened evenly, even tension being kept on the rods or bolts, and the gasket; the gasket shall seat properly in the corrugations.
4. Watertight joints shall remain uncovered for a period of time designated, and before being covered, tightness of the nuts shall be measured with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, the nut shall be retightened with a torque wrench and remain uncovered until a tight, permanent joint is assured.

3.5 Drainage Structures

A. Manholes and Inlets

1. Construction shall be of reinforced concrete or precast reinforced concrete, complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated.
2. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

B. Walls and Headwalls: Construction shall be as indicated.

3.6 Steel Ladder Installation

- #### A.
- Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

3.7 Backfilling

A. Backfilling Pipe in Trenches

1. After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth.
2. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe.
3. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the midpoint (spring line) of RCP or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe.
4. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding [__] inches.
5. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Engineer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly.
 - a. Untreated sheeting shall not be left in place beneath structures or pavements.

B. Backfilling Pipe in Fill Sections

1. For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below.
 2. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming.
 3. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less.
 4. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding [__] inches. Use select granular material for this entire region of backfill for flexible pipe installations.
- C. Movement of Construction Machinery: When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.
- D. Compaction
1. Minimum Density
 - a. Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.
 - b. Under paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.
 - c. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
 - d. Under nontraffic areas, density shall be not less than that of the surrounding material.
 2. Determination of Density:
 - a. Testing is the responsibility of the Contractor and performed at no additional cost to the Owner. Testing shall be performed by an approved commercial testing laboratory.

- b. Tests shall be performed in sufficient number to ensure that specified density is being obtained.
- c. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper.
- d. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D6938. When ASTM D6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D6938 results in a wet unit weight of soil and ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D6938.
- e. Test results shall be furnished the Engineer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.8 Pipeline Testing

A. Leakage Tests

- 1. Lines shall be tested for leakage by low pressure air or water testing or exfiltration tests, as appropriate.
 - a. Low pressure air testing for concrete pipes shall conform to ASTM C969.
 - b. Low pressure air testing for plastic pipe shall conform to ASTM F1417.
 - c. Low pressure air testing procedures for other pipe materials shall use the pressures and testing times prescribed in ASTM C828 or ASTM C969, after consultation with the pipe manufacturer.
- 2. Testing of individual joints for leakage by low pressure air or water shall conform to ASTM C1103. Prior to exfiltration tests, the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.
- 3. Visible leaks encountered shall be corrected regardless of leakage test results.
- 4. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Engineer.

5. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested.
 - a. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished.
 - b. The amount of water required to maintain this water level during a 2-hour test period shall be measured.
 - c. Leakage as measured by the exfiltration test shall not exceed 250 gallons per inch in diameter per mile of pipeline per day. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished.

B. Post-Installation Inspection

1. Check each reinforced concrete pipe installation for joint separations, soil migration through the joint, cracks greater than 0.01 inches, settlement and alignment.
2. Check each flexible pipe (HDPE, PVC, CMP, PP) for rips, tears, joint separations, soil migration through the joint, cracks, localized bucking, bulges, settlement and alignment.
3. Replace pipes having cracks greater than 0.1 inches in width or deflection greater than 5 percent deflection.
4. An engineer shall evaluate all pipes with cracks greater than 0.01 inches but less than 0.10 inches to determine if any remediation or repair is required.
5. Repair or replace any pipe with crack exhibiting displacement across the crack, exhibiting bulges, creases, tears, spalls, or delamination.
6. Reports: The final post installation inspection report shall include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design, grade, deviation from line, deflection and deformation of flexible pipe systems, inspector notes, condition of joints, condition of pipe wall (e.g. distress, cracking, wall damage dents, bulges, creases, tears, holes, etc.).

3.9 Field Painting

- A. [After installation, clean cast-iron frames, covers, gratings, and steps not buried in masonry or concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint.]
- B. [After installation, clean steel covers and steel or concrete frames not buried in masonry or concrete to bare metal of mortar, dirt, grease, and other deleterious materials. Apply a coat of primer, [_____], to a minimum dry film thickness of

[_____] mil; and apply a top coat, [_____] to a minimum dry film thickness of [__]
mm mils, color optional. Painting shall conform to Section [09 90 15 PAINTS AND
COATINGS.]] Do not paint surfaces subject to abrasion.

END OF SECTION

Precast Reinforced Concrete Box Culverts and Accessories

Part 1 General

1.1 Scope

- A. This Section describes products to be incorporated into precast reinforced concrete box culverts and accessories, and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Concrete Pipe Association (ACPA), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.

1.2 Qualifications

If requested by the Engineer, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

1.3 Submittals

- A. Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of Section 01 33 00 of these Specifications.
- B. Structural calculations are to be submitted to all affected railroads prior to fabrication of those segments of box culvert.

1.4 Transportation and Handling

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing box sections and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.
- B. Handling: Handle box sections and accessories carefully to prevent shock or damage. Do not use material damaged in handling.

1.5 Storage and Protection

- A. Store all box sections that cannot be distributed along the route. Make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all box sections and other appurtenances shall be kept free from dirt or foreign matter at all times.
- C. Store joint sealants out of direct sunlight.

1.6 Quality Assurance

- A. Product manufacturers shall provide the Engineer with written certification that all products furnished comply with all applicable provisions of these Specifications.
- B. If ordered by the Engineer, each manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of the products. This service will be furnished for a minimum of five days during box installation.

Part 2 Products

2.1 Precast Reinforced Concrete Box Sections

- A. Precast reinforced concrete box sections shall be monolithic single cell units, including invert. Box culverts which are installed partially or fully within the Theoretical Embankment Line of the Railroad (as shown on the Drawings) shall meet the requirements below for box culverts under railroad jurisdiction. Additionally, design of box culverts under railroad jurisdiction must be submitted to and receive the approval of Norfolk-Southern. Manufacturer shall obtain evidence of Norfolk-Southern approval prior to submittal of shop drawings to the Engineer.
 - 1. Box sections not under railroad jurisdiction shall be designed and manufactured in accordance with ASTM C 1433 Table 1 – Design Requirements for Precast Concrete Box Sections Under Earth Dead and HS20 Live Load Conditions. Box culverts under railroad jurisdiction shall be designed and manufactured in accordance with AREMA Chapter 8, Parts 13 and 16. The manufacturer may interpolate the steel area requirements for fill heights between noted design earth cover increments.
 - 2. Box sections shall be designed for external loads equal to the sum of the dead load plus live load for the following conditions:
 - a. The minimum dead load shall be that created by the depth of cover indicated on the Drawings, the depth of cover based on difference in elevation of near edge of pavement and top of box section, or eight feet, whichever is greater.
 - b. For box culverts not under railroad jurisdiction, minimum live load shall be equal to AASHTO HS-20 loading created by the depth of cover indicated on the Drawings or the depth of cover based on difference in elevation of near edge of pavement and top of box section, which ever creates the higher loading. For box sections under railroad jurisdiction, the minimum live load shall be equal to AREMA Cooper E-80. An impact factor of 1.75 (multiply live load by the impact factor) shall be used for depth of cover up to 5 feet. Between 5 and 30 feet, the impact factor is reduced by 0.03 per foot of depth. Below a depth of 30 feet, the impact factor is one.
 - 3. Special Design:

Precast Reinforced Concrete Box Culverts and Accessories

- a. Box sections, which are beyond the sizes and loads indicated in Table 1, and not under railroad jurisdiction, shall be designed in accordance with ASTM C 1433 Appendix X1 for HS 20 live loads plus earth dead loads.
- b. The manufacturer may request the Engineer's approval of modified designs for box culverts not under railroad jurisdiction which differ from the designs of Section 7 of ASTM C 1443, except that no consideration will be given to designs unless they are for monolithic single cell units. The Engineer reserves the right to reject modified designs for any or no reasons.

B. Joints

1. The precast reinforced concrete box sections shall be manufactured with tongue and groove ends. Seal joints between sections by means flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of ASTM C990. Sealant shall be pre-formed type sized per manufacturer's recommendations, but a minimum nominal cross-sectional area equal to diameter of 1-inch. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants CS202.
2. Under Railroads: For box culverts under railroads, mechanical connections are required at all joints. The exterior of box culvert joints shall be provided with an external joint wrap around the entire box circumference with a product equal to ConWrap CS-217 as manufactured by Concrete Sealants. Contractor may provide alternatives to providing joint wrap to bottom of culverts. These connections shall be made by eyebolts in each box section with threaded rods holding sections together at each of four corners.

C. Acceptance

1. Acceptance will be based in part on the concrete compressive strength tests described in Section 10 and by the material requirements described in Section 6 of ASTM C 1433. Additional causes for rejection are identified in ASTM C 1433, Section 14.
2. No box section shall be shipped before all concrete has reached its 28-day design strength.
3. Inspect box section after delivery for markings in accordance with ASTM C 1433, Section 15, cracks, uniformity, blisters and imperfect surfaces, and damaged ends. Any box section repaired or patched is subject to rejection if such repairs or patches, in the opinion of the Engineer or Owner, are not sound and properly finished.

2.2 Manholes and Precast Concrete Products

As specified in Sections 33 44 13.16 and 03 30 00.

Part 3 Execution

3.1 Existing Utilities and Obstructions

Precast Reinforced Concrete Box Culverts and Accessories

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall call 811 Call Before You Dig for area where Project is located, as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.
1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only ten days after original notice. The Contractor shall ensure, at the time of any excavation that a valid utility location exists at the point of excavation.
 2. Expose the facility to verify its true location and grade for a distance of at least 200 feet in advance of pipeline construction to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
 3. Avoid utility damage and interruption by protecting it with means or methods recommended by the utility owner.
 4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly, or more frequently if required.
- C. Conflict with Existing Utilities
1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the sewer by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the sewer to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by the Engineer. Where such relocation of the sewer is not approved by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
 2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed sewer does not permit the crossing without immediate or potential future damage to the utility, main, service, or the sewer. The Contractor may change the proposed grade of the sewer to avoid vertical conflicts if the changed grade provides minimum required capacity, maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by the Engineer. Where such relocation of the sewer is not approved by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

- D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- E. Water and Sewer Separation
 - 1. Precast reinforced concrete box culverts should maintain a minimum 10 foot edge-to-edge separation from water mains. Where the sewer crosses a water main, an 18-inch vertical separation shall be maintained where possible. Where possible, a full joint of sewer pipe shall be centered over the water main. Any deviation shall be requested in writing to the Engineer.
 - 2. No water main shall be permitted to pass through or come in contact with any part of a manhole.

3.2 Construction Along Highways, Streets, and Roadways

- A. Install box culverts and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the State Department of Transportation, County, and the City with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Traffic Control
 - 1. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved flagman training program.
 - 2. Construction traffic control devices and their installation shall be in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways.
 - 3. Placement and removal of construction traffic control devices shall be coordinated with the State Department of Transportation, County and the City a minimum of 48 hours in advance of the activity.
 - 4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed.
 - 5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected

Precast Reinforced Concrete Box Culverts and Accessories

traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair, and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.
7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the State Department of Transportation, County and the City. Sign panels shall be of durable materials capable of maintaining their color, reflective character and legibility during the period of construction.
8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the current Manual On Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

C. Construction Operations

1. Perform all work along highways, streets and roadways to minimize interference with traffic.
2. Stripping: Where the box culvert is laid along road right-of-way, strip and stockpile all sod, topsoil and other material suitable for right-of-way restoration.
3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.

D. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off the pavement in a timely manner.

E. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

- G. Maintaining Highways, Streets, Roadways and Driveways
1. Maintain streets, highways, roadways and driveways in suitable condition for movement of traffic until completion and final acceptance of the work.
 2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets and roadways by the use of steel running plates. The edges of running plates shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted, as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.
 3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. Make the grader or front-end loader available at all times.
 4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the work.

3.3 Box Culvert Distribution

- A. Box culvert shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No box culvert shall be strung further along the route than 200 feet beyond the area in which the Contractor is actually working without written permission from the Owner. The Owner reserves the right to reduce this distance based on the effects of the distribution to traffic and the adjacent property owners.
- C. No street or roadway may be closed for unloading of box culvert without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which box culvert is distributed.
- D. No distributed box culvert shall be placed inside drainage ditches.

3.4 Location and Grade

- A. The Drawings show the alignment and grade of the box culvert and the position of manholes and other appurtenances. The slope shown on the profile and/or called for in the Specifications is the slope of the invert of the box culvert.
- B. From the information on the Drawings and the survey points found on the Project site, the Contractor shall perform all surveys necessary for the establishment of the horizontal and vertical alignment of the box culvert.
- C. Reference Points
1. The Contractor shall take all precautions necessary, which includes, but is not necessarily limited to, installing reference points, in order to protect and preserve the centerline or baseline established by the Engineer.

Precast Reinforced Concrete Box Culverts and Accessories

2. Reference points shall be placed, at or no more than three feet, from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use prior to his verifying reference point locations. Distances between reference points and the manhole centerlines shall be accurately measured to the nearest 0.01 foot.
 3. The Contractor shall give the Engineer reasonable notice that reference points are set. The reference point locations must be verified by the Engineer prior to commencing clearing and grubbing operations.
- D. After the Contractor locates and marks the manhole centerlines or baselines of the box culvert, the Contractor shall perform clearing and grubbing.
 - E. Cut Sheets shall be prepared and submitted as required in Section 01 71 23.13 of these Specifications.
 - F. Construction shall begin at the low end of the box culvert and proceed upstream without interruption. Multiple construction sites shall not be permitted without written authorization from the Engineer for each site. As a minimum, cut sheets between construction sites shall be submitted and approved before multiple construction sites will be permitted.
 - G. The Contractor shall be responsible for any damage done to reference points, base lines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, base lines, center lines and temporary bench marks as a result of the operations.
 - H. Survey Cash Allowance: The survey cash allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed and is not to be used by the Contractor to provide cut sheets. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks or verifying that the work has been performed accurately.

3.5 Construction Loads

The Contractor shall take precautions not to induce loads on the box sections beyond those for which the box sections are designed to withstand. The Contractor's project manager and superintendent shall meet with the manufacturer to determine what are and are not permissible construction loads. Construction loads shall include those induced by heavy equipment movement and stockpiling material over or adjacent to the box culvert.

3.6 Laying and Jointing Box Sections, Pipe and Accessories

- A. Lay all box sections and accessories to accurately conform to the lines and grades established by the Engineer.
- B. Installation

1. Proper implements, tools and facilities shall be provided for the safe performance of the work. All materials shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to materials. Under no circumstances shall materials be dropped or dumped into the trench.
2. All materials shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.
3. The outside of the spigot end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the box culvert is laid. No box section that contains dirt shall be laid.
4. Foreign material shall be prevented from entering the box section while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the box section at any time.
5. As each length of box section is placed in the trench, the joint shall be assembled and the box section brought to correct line and grade. The two box sections shall be pulled together by use of a winch, come-a-long system or similar equipment which shall compress the sealant in the joint. The box section shall be secured in place with approved backfill material.
6. Applying pressure to the top of the box section, such as with a backhoe bucket, to lower the box section to the proper elevation or grade shall not be permitted.
7. The box culvert joints shall be sealed on the interior with non-shrink grout where leaks are visible.

C. Alignment and Gradient

1. Lay box section straight in alignment and gradient as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.
3. The Contractor shall check the invert elevation at each manhole and the box section invert elevation at least three times daily, start, mid-day and end of day. Elevations shall be checked more frequently if more than 100 feet of box culvert is installed in a day or if the box culvert is being constructed at minimum slope.
4. The Contractor shall check the horizontal alignment of the box culvert at the same schedule as for invert elevations.

D. Expediting of Work: Excavate, lay the box culvert, and backfill as closely together as possible. Do not leave jointed box sections in the trench overnight. Backfill and

Precast Reinforced Concrete Box Culverts and Accessories

compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed box culvert each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted box section or accessory, close the end with a suitable plug, as approved by the Engineer.

- E. Drop Connections, Bends, and Transitions: Concrete Box Culvert manufacturer shall design and manufacture drop connections and bends, as well as transitions/connections from/to box culverts to round pipe. The design shall be performed by an engineer registered in the State of Georgia, and the design shall be sealed and signed by said Engineer. The geometry of these structures and assumed loadings on structure shall be submitted to and subject to the approval of the Engineer.

3.7 Manhole and Precast Concrete Product Construction

As specified in Sections 33 44 13.16 and 03 30 00.

3.8 Inspection and Testing

- A. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the box culvert by means of scraping, swabbing, or other instruments. When requested by the Engineer, flush out lines and manholes before final inspection.
- B. Alignment: Box culverts lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection.
- C. Joints: All box culverts constructed shall be visually observed for watertightness. All visible leaks shall be repaired.

3.9 Protection and Restoration of Work Area

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
 - 1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 - 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 - 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.

Precast Reinforced Concrete Box Culverts and Accessories

4. The Department of Transportation's engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.
 - B. Man-Made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the work.
 - C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Engineer. Any such trees or shrubbery that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
 - D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
 - E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.

END OF SECTION

Part 1 General

1.1 Scope

- A. The work covered by this Section shall consist of furnishing all materials for and constructing complete, all inlets at the locations shown on the Drawings or designated by the Engineer.
- B. Inlets shall be constructed to the size, shape and dimensions and at the locations shown on the Drawings or as directed by the Engineer. Inlets may be constructed either of brick, concrete masonry, or precast concrete at the option of the Contractor. They shall be provided with cast iron frames and gratings as specified herein and shown on the Drawings.
- C. Each inlet shall be connected to the newly constructed storm sewer using pipe and suitable fittings as noted on the Drawings.
- D. Inlets shown as Georgia Department of Transportation shall be constructed to the Georgia Department of Transportation Standards and Specifications, not included as a part of this document.

Part 2 Products

2.1 Materials

- A. Concrete shall be as specified in Sections 03 11 00 and 03 30 00 of these Specifications.
- B. Brick shall conform to ASTM C 32, Grade SM. Sand for mortar shall conform to ASTM C 144. Hydrated lime shall conform to ASTM C 206.
- C. Frames and gratings shall be of the type shown on the Drawings. Iron castings shall conform to ASTM A 48, Class 35B. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blowholes and other defects affecting their strength. Bearing surfaces between cast frames and gratings shall be machined, fitted together and match marked to prevent rocking. All castings shall be thoroughly cleaned and painted or coated with a coal tar pitch varnish.
- D. Inlets, grates and frames in paved and roadway areas shall be rated for a minimum HS-20 loading. Inlets, grates and frames in non-paved and non-roadway areas shall be rated for a minimum 2,000 pound wheel load unless shown otherwise on the Drawings. Minimum clear opening areas shall be as shown on the Drawings.
- E. Precast Concrete Sections: As specified in Section 03 30 00.

Part 3 Execution

3.1 Excavation

Excavation shall be in accordance with the requirements of Section 31 23 33, Trench

Inlets

Excavation and Backfill, of these Specifications.

3.2 Brick Construction

- A. Brickwork shall be constructed using one part Portland cement to two parts clean sand, thoroughly mixed to workable plastic mixture. Not over 20 pounds of hydrated lime per sack of cement may be added. No retempered mortar shall be used. Brick shall be laid with mortar joints 3/8-inch thick. The inside of the inlet shall be neatly finished with cement mortar 1/2-inch thick.
- B. Each sixth brick course shall be a "Stretcher" course. Inside joints shall be trowel struck flush joints to provide smooth, clean surfaces. Joints shall be broken in successive layers. Wall thickness for inlets 12 feet and less deep shall be 8-inches. Wall thickness for the portion of inlets over 12 feet deep shall be 12-inches.
- C. After the foundation has been prepared and has been approved by the Engineer, the bottom shall be constructed to the required line and grade. After the bottom has been allowed to set for a period of not less than 24 hours, the inlet shall be constructed thereon, care being exercised to form the incoming and outgoing sewer pipe into the wall of the inlet at the required elevation.
- D. Manhole steps shall be inserted into the wall of the manhole at the proper locations and elevations as the work progresses and shall be securely embedded in the masonry.

3.3 Precast Concrete Construction

- A. After the base section has been set, and inverts formed, the precast sections shall be placed thereon, care being exercised to form the incoming and outgoing pipes into the wall of the inlet at the required elevations.
- B. Masonry work shall be allowed to set for a period of not less than 24 hours. Outside forms, if any, then shall be removed and the inlet backfilled and compacted. All loose or waste material shall be removed from the interior of the inlet. The inlet grate then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

3.4 Inverts

Inverts shall conform to the shape indicated on the Drawings or as directed by the Engineer. The invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the inlet shall be made to a true curve with as large a radius as the size of the inlet will permit.

3.5 Inlet and Outlet Pipe

- A. Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be placed in an inlet. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bell end uphill. Trench bottoms found to be unsuitable for foundations shall be corrected in accordance with Section 31 23 33 of these Specifications prior to installation of pipe in inlets.

- B. Pipe placed in the walls for outlet connections shall extend through the wall and beyond the outside surface of the walls to allow for connections, the end of the pipe being placed flush with the inside face of the wall. Masonry shall be carefully constructed around the pipe for the full wall thickness so there will be no leakage around the outer surface.

3.6 Castings

- A. Cast iron frames shall be set accurately to line and finished elevation so that subsequent adjustments will not be necessary.
- B. Where inlets are constructed in paved areas or integral with curb and gutter, the top surface of the frame and grate shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement or curb and gutter.
- C. Frames shall be set in full cement mortar beds as shown on the Drawings set in place to match the finished concrete surface.

3.7 Cleaning

- A. After completion of the inlet, the interior shall be thoroughly cleaned of all excess materials, the grating placed and all unused materials, tools, equipment and debris removed from the area.
- B. After the masonry and frames have had sufficient time to set, but in no case less than 24 hours after placement, the space around the inlet shall be backfilled and tamped to the required grade.
- C. Final cleaning shall be performed in accordance with the requirements of Section 01 74 00 of these Specifications.

END OF SECTION