

**PROJECT MANUAL**

**DUPONT PUMP STATION AND  
BASIN IMPROVEMENTS – PHASE 2  
(Contract B)**

**CONTRACT NO. W-12-026-203**



**MAYOR AND CITY COUNCIL**

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Darrin Ledford, Councilman  
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**November 2019**



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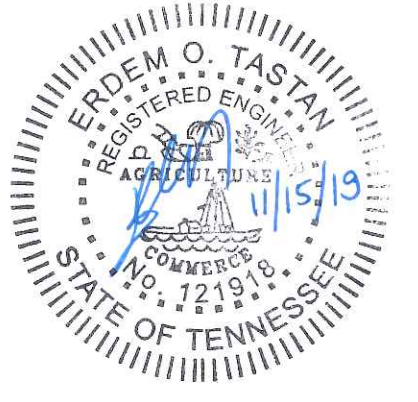
**DUPONT PUMP STATION AND  
BASIN IMPROVEMENTS – PHASE 2  
(Contract B)**

**CITY OF  
CHATTANOOGA, TENNESSEE**

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**Project: Dupont Pump Station and Basin Improvements – Phase 2 (Contract B)**

**CDM Smith Project Number: 129699-109746**

Project Specifications	Engineer
<ul style="list-style-type: none"><li>- <b>Division 00: Procurement and Contracting Requirements</b></li><li>- <b>Division 01: General Requirements</b></li><li>- <b>Division 02: Existing Conditions</b></li><li>- <b>Division 03: Concrete</b></li><li>- <b>Section 31 11 00 Clearing and Grubbing</b></li><li>- <b>Section 31 23 16 Rock Removal</b></li><li>- <b>Division 32 Exterior Improvements</b></li><li>- <b>Section 33 05 05 Buried Piping Insulation</b></li><li>- <b>Section 33 05 19 Ductile Iron Pipe</b></li><li>- <b>Section 33 05 60 Precast Concrete Structures</b></li></ul>	 <p>Daniel I. Unger, P.E.</p>
<ul style="list-style-type: none"><li>- <b>Section 31 09 00 Geotechnical Instrumentation</b></li><li>- <b>Section 31 23 00 Earthwork</b></li><li>- <b>Section 31 23 19 Dewatering and Drainage</b></li><li>- <b>Section 31 23 33 Trenching, Backfilling and Compaction</b></li><li>- <b>Section 31 75 01 Excavation Support and Protection</b></li><li>- <b>Section 33 05 25 Jacking Under Railroads</b></li></ul>	 <p>Tastan E. Onur, P.E.</p>

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**CITY OF CHATTANOOGA  
PUBLIC WORKS DEPARTMENT  
ENGINEERING DIVISION**

**CERTIFICATION AND SEAL**

The Project Drawings and the Contract Documents and Specifications for the following contract were prepared by me or under my direct supervision, and I am a duly registered engineer under the laws of the state in which these projects are located:

**DUPONT PUMP STATION AND  
BASIN IMPROVEMENTS – PHASE 2  
(Contract B)**

**CONTRACT NO. W-12-026-203**



Tennessee P.E. Number 115937

\_\_\_\_\_  
(Date)

APPROVED FOR RELEASE

  
\_\_\_\_\_  
William C. Payne, P.E.  
City Engineer

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## SPECIFICATIONS

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Division 32 – Exterior Improvements

32 92 19	Loaming, Seeding and Mulching
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Division 33 – Utilities

33 05 05	Buried Piping Insulation
33 05 19	Ductile Iron Pipe
33 05 25	Jacking Under Railroads
33 05 60	Precast Concrete Structures



Tennessee 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.

The allotted time for construction is 300 calendar days. Refer to Sections 00 41 00 and 01 11 00 for additional information.

No bid may be withdrawn within 120 calendar days after the scheduled time for receipt of bids.

All bidders must be licensed and shall comply with all requirements of the State of Tennessee Contractor's Licensing Act.

Visit City website at: [www.chattanooga.gov/purchasing/bidssolicitations](http://www.chattanooga.gov/purchasing/bidssolicitations) for specific contract information.

The City of Chattanooga is an Equal Opportunity Employer.

Any contract or contracts awarded under this Advertisement for Bids are expected to be funded with local funds in addition to funds indicated elsewhere.

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 any or all Bids, to waive informalities and to readvertise.

CITY OF CHATTANOOGA, TENNESSEE

RECOMMENDED FOR APPROVAL:

APPROVED:

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William C. Payne, P.E.  
City Engineer  
Department of Public Works

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Justin C. Holland  
Administrator  
Department of Public Works

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 Documents are to be issued and where the bidding procedures are to be administered. The issuing office for this Project is City of Chattanooga Purchasing Department, 101 East 11th Street, Suite G13, Chattanooga, TN 37402.

**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.
- 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 Tennessee 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, shall mean meeting the experience requirements contained in technical specifications (Divisions 02, 03, 31, 32, and 33).

- 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 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, 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 included elsewhere in this Project Manual.
  - B. Bidder's Tennessee contractor license number and classification.
- 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 qualified.
  - 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 City or having 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 City will hinder or prevent prompt completion of additional work, if awarded.

#### **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 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 Owner in writing. Interpretations or clarifications considered necessary by Owner in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Owner 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 City of Chattanooga Purchasing Department, 101 East 11th Street, Suite G13, Chattanooga, TN 37402 and shall utilize the Request for Bidder Information which follows this section.

#### **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 certified check or cashier's check, 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.
- 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, or those substitute or “or-equal” materials and equipment approved by Engineer and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or “or-equal” item. No item of material or equipment will be considered by Engineer as a substitute or “or-equal” unless written request for approval has been submitted by Bidder and has been received by Engineer at least 15 days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

#### **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.

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**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**

- 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 Bid Form, Bid Bond Form and the required documents listed below. The unbound copy of the Bid Form is to be completed and submitted with the Bid security along with the documents listed below. The bidder shall submit one original of all documents in the envelope.

- A. Statement of Bidders Qualifications
- B. Affidavit of No Collusion by Prime Bidder
- C. Drug-Free Workplace Affidavit
- D. Attestation Regarding Personnel Used in Contract Performance
- E. Certification By Proposed Prime or Subcontractor Regarding Equal Employment Opportunity
- F. Certification Regarding Debarment, Suspension and Other Responsibility Matters
- G. Iran Divestment Act Compliance 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 with the "Contractor's Identification" form securely attached thereto and shall 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 The Bidder shall comply with Tennessee Code Annotated (TCA) Chapter 6 of Title 62, hereby incorporated by reference. Except for bids in an amount less than twenty five thousand dollars, the Bidder shall provide the name, license number, expiration date thereof, and license classification of the contractors applying to the bid for the prime contract and for the masonry contract where the total cost of the masonry portion of the construction project exceeds one hundred thousand dollars, materials and labor, electrical, plumbing, heating, ventilation and air conditioning contracts on the outside of the envelope containing the Bid. Only one contractor in such classification may be listed. Prime contractor bidders who are to perform the masonry portion of the construction project which exceeds one hundred thousand dollars, materials and labor, the electrical, plumbing, heating, ventilation and air conditioning shall be so designated upon the outside of the envelope. When the bid is less than twenty five thousand dollars, the name of the contractor only shall appear on the outside of the envelope containing the bid. Failure of any bidder to comply therewith shall void such bid and such bid shall not be considered.

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

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**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.
- 17.02 The officer whose duty is to open them will decide when the specified time has arrived, and no bids received thereafter will be considered. No responsibility will be attached to any officer for the premature opening of a bid not properly addressed and identified. Bidders or their authorized agents are invited to be present.
- 17.03 Filing of Proposal
- A. No proposals will be considered by the City unless they are filed in sealed envelopes with the City within the time limit for receiving proposals as stated in the advertisement and shall be made on proposal forms attached to Specifications, together with the Contract Documents, Bid Bond, and Statement of Compliance with General Contractors Licensing Law and other required miscellaneous forms, all of which are to be sealed in an envelope addressed to the City of Chattanooga, Tennessee, with the completed "Contractor's Identification" form securely attached thereto.
- B. Each proposal must contain the full name and address of each person, firm or corporation interested therein. In case of a partnership, the name and address of each partner must be stated. The firm, corporation or individual name of the bidder must be signed in the space provided for the signature on the proposal blank. In case of a corporation, the title of the officer signing must be stated, and the person signing shall also state under the laws of what State the corporation was chartered and the names and titles of the officers having authority, under the by-laws, to sign contracts. The proposal shall also be attested by its Secretary. In case of a partnership or firm, the signature of at least one of the partners must follow the firm name.
- 17.04 Opening of Proposals. The proposals filed with the City will be opened at the time stated in the advertisement. Bidders are invited to attend the meeting at the time set for opening of proposals, at which time they should make any protests as to procedure followed in inviting 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. Nothing herein shall be deemed to limit the discretion of the City to determine whether or not a bidder not hereby disqualified is the lowest responsible 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 Bidders debarred or suspended under Chattanooga City Code, Part II, Chapter 2, Article XX (Ordinance No. 8259), or who are debarred or suspended by operation of any other applicable state or federal law or regulation, are not eligible to be contractors or subcontractors to this contract.
- 19.06 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or 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.
- 19.07 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.
- 19.08 All Bidders are required to execute a notarized Affidavit of No Collusion by Prime Bidder, and a Bidder who fails to do so will be disqualified.
- 19.09 The Contracts will be awarded to the responsive, responsible Bidders submitting the lowest Bid complying with the conditions of the Contract Documents. Award will be made on the basis of the prices given in the Bid.

- 19.10 Conditions Precedent to Award of Contracts. The following stipulations shall all and severally be conditions precedent to the award by the City of Chattanooga of all contracts for construction, to-wit:
- A. No member of the City Council nor any officer, director or other person whose duty it is to vote for, let out, overlook or in any manner superintend this contract and who is related to said member within the third degree by either consanguinity or affinity, nor any other official who may be directly interested in this contract or work of any kind whatsoever under its direction. "Directly interested" means any contract with the official himself or with any business in which the official is the sole proprietor, a partner, or the person having the controlling interest. "Controlling interest" shall include the individual with the ownership or control of the largest number of outstanding shares owned by any single individual or corporation.
  - B. It shall not be lawful for any officer, director, or other person whose duty it is to vote for, let out, overlook, or in any manner to superintend any work or any contract in which the City shall or may be interested, to be indirectly interested in any such contract unless the officer publicly acknowledges his interest and rescues himself from any of his duties which include the consideration of, voting on, letting out, overseeing, or superintending the work or contract giving rise to the conflict. "Indirectly interested" means any contract in which the officer is interested but not directly so, but includes contracts where the officer is directly interested but is the sole supplier of goods or services in a municipality or county. (See T.C.A. Section 12-4-101, et seq.)
  - C. The essence of all the contracts shall be excellence of quality, integrity and durability of the completed product as specified; and the contractor hereunder shall be held responsible therefor.
  - D. The contractor shall maintain and guarantee the integrity of the completed work for a full period of one year after the completion as set forth more fully in Section 4 of these General Provisions.
  - E. The decisions of the Engineer, as to quality, integrity and durability of the work shall be final and conclusive as to all parties to said contract, whether it be directly by and between the contractor and said City or by and between him and another party; and said Engineer shall have full authority to condemn by written notice to contractor, or his agent or foreman on job, and shall order the removal, reconstruction and restoration of all work that in his opinion, is in any respect inferior, defective or faulty, or that shows signs of disintegration and failure, at any time before final estimate is issued and payment made therefor, or within a period of one year after the completion and acceptance thereof in writing by the City.
  - F. Contractor shall remove, reconstruct and restore all such condemned work in full conformance with the specifications, and in complete compliance with the requirements of the official notice, in writing, of said Engineer relating thereto, and within the period of time designated in the notice.
  - G. Should the contractor neglect, refuse, or fail to remove, reconstruct and restore all of the defective work so condemned and rejected, within the period of time, as required by said official notice, then and in event of such failure on contractor's part, whether said work was executed by contract directly with the City or by private contract directly



with other parties, the City of Chattanooga will look to and require, respectively, the surety on the Performance Bond, executed by the contractor under contract directly with said City, to make good and have all such defective and condemned work removed, reconstructed and restored in complete compliance with the requirements of the official notice of said Engineer to that effect; and likewise, in the event that such work was done under private contract, as aforesaid, the City of Chattanooga will look to and require the surety on the Performance Bond executed by said contractor to make good and have all such defective and condemned work removed, reconstructed and restored in complete compliance with the requirements of the official notice of said Engineer to that effect, in each instance as the case may be.

- H. The unit price bid by the contractor for any and all work and the compensation to be paid therefore shall cover and include the cost of all materials, forms, supports, labor, work and things necessary for a complete workmanlike job, and shall also include the cost of all services, duties and obligations of said contractor and of the corresponding surety on the Performance Bond collateral therewith as stipulated in subsections above set out, to the satisfaction and approval of the Engineer.

#### 19.11 Award of Contract.

- A. The City acting by and through the City Council will either award the contract or reject all proposals received thereon after the formal opening of proposals and evaluation of the bids.
- B. The award of the contract, if it is awarded, will be to the lowest responsible bidder whose proposal complies with the requirements of the City.
- C. Projects will be awarded only to responsible bidders, and an award will not be made in any case, until all necessary investigations have been made into the responsibility of the low bidder.
- D. If the project is funded in part by a state or federal grant, then the award may be subject to the concurrence of the granting contract agency.
- E. All references to contract include each to be awarded where multiple awards are made.

### **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 issues a Notice of Award to the Successful Bidder, Owner shall notify the Successful Bidder that the required number of unsigned counterparts of the Agreement along with the other Contract Documents will be available to be picked up, 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 City 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 City would be put by reason of said bidder's failure to execute said bonds and contract within ten days, the proposal guaranty accompanying the proposal shall be the agreed amount of damages which the City will suffer by reason of such failure on the part of the bidder and shall thereupon immediately be forfeited to the City. 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**

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1015 15th Street N.W., Washington, DC 20005  
(202) 347-7474  
[www.acec.org](http://www.acec.org)

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

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Request for Bidder Information

Questions regarding the project or the Bid Documents must be in writing as required by the Instruction to Bidders. Questions must be written on this form and sent by email, fax or mail to the email, fax number or address listed below. Upon timely receipt, if appropriate, an Addendum will then be issued to all persons who have received Bid Documents from the Owner.

City of Chattanooga  
Purchasing Department  
101 E. 11th Street, Suite G13  
Chattanooga, TN 37402  
[purchasing@chattanooga.gov](mailto:purchasing@chattanooga.gov)  
Phone Number: (423) 757-7230  
Fax Number: (423) 643-7244

Contract: **DuPont Pump Station and Basin Improvements – Phase 2 (Contract B)**

Contract Number: **W-12-026-203**

From: \_\_\_\_\_

Company: \_\_\_\_\_

Date: \_\_\_\_\_

CLARIFICATION IS NEEDED FOR THE FOLLOWING ITEMS:  
(List Specification Section, Paragraph, Drawing Number and/or Detail Number)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

END OF DOCUMENT

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**DUPONT PUMP STATION AND BASIN IMPROVEMENTS - PHASE 2  
(CONTRACT B)  
CONTRACT NUMBER W-12-026-203**

**ARTICLE 1 – BID RECIPIENT**

1.01 This Bid is submitted to:

City of Chattanooga, Tennessee  
Purchasing Department  
101 E. 11<sup>th</sup> Street, Suite G13  
Chattanooga, Tennessee 37402

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) 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 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	Estimated Qty.	Unit	Unit Price	Total Price
<b>Mobilization/Demobilization</b>					
1	Mobilization/Demobilization	1	LS	\$	\$
<b>Demolition</b>					
2	Demolition – Structures & Underground Piping	1	LS	\$	\$
3	Abandon & Grout Fill Existing 36" RCP Gravity Sewer including Plugging Existing 36" RCP	1	LS	\$	\$
4	Abandon & Grout Fill Existing 30" RCP Gravity Sewer	1	LS	\$	\$
5	Abandon & Grout Fill Existing 30" DIP Forcemain	1	LS	\$	\$
<b>Site Grading</b>					
6	Site Grading Including Imported Fill Material	1	LS	\$	\$
7	Fill to meet minimum 36" cover requirement	4,500	CY	\$	\$
<b>Sanitary Sewer Pipe</b>					
8	48-Inch DI (Class 250)	6,180	LF	\$	\$
9	8-inch DI (Class 250)	37	LF	\$	\$
10	16-inch DI (Class 250)	60	LF	\$	\$
11	36-inch DI (Class 250)	46	LF	\$	\$
12	60" Steel Casing	110	LF	\$	\$
13	Railroad Jack and Bore	1	LS	\$	\$
14	Launch and Exit Shafts	475	CY	\$	\$
<b>Sanitary Sewer Manholes</b>					
15	4' Dia. MH 0'-6' Cut	2	EA	\$	\$
16	5' Dia. MH 0'-6' Cut	0	EA	\$	\$
17	5 Dia. MH 6'-8' Cut	0	EA	\$	\$
18	5' Dia. MH 8'-10' Cut	0	EA	\$	\$
19	5' Dia. MH 10'-12' Cut	0	EA	\$	\$
20	5 Dia. MH 12'-14' Cut	0	EA	\$	\$
21	5' Dia. MH 14'-16' Cut	0	EA	\$	\$
22	5' Dia. MH 16'-18' Cut	1	EA	\$	\$
23	6' Dia. MH 0'-6' Cut	2	EA	\$	\$
24	6' Dia. MH 6-8' Cut	4	EA	\$	\$
25	6' Dia. MH 8-10' Cut	4	EA	\$	\$
26	6' Dia. MH 10'-12' Cut	1	EA	\$	\$

27	6' Dia. MH 12'-14' Cut	2	EA	\$	\$
28	6' Dia. MH 14'-16' Cut	3	EA	\$	\$
29	8' Dia. MH 0'-6' Cut	0	EA	\$	\$
30	8' Dia. MH 6-8' Cut	0	EA	\$	\$
31	8' Dia. MH 8-10' Cut	0	EA	\$	\$
32	8' Dia. MH 10'-12' Cut	0	EA	\$	\$
33	8' Dia. MH 12'-14' Cut	0	EA	\$	\$
34	8' Dia. MH 14'-16' Cut	1	EA	\$	\$
35	9' Dia. MH 0-6' Cut	0	EA	\$	\$
36	9' Dia. MH 6-8' Cut	0	EA	\$	\$
37	9' Dia. MH 8-10' Cut	0	EA	\$	\$
38	9' Dia. MH 10'-12' Cut	1	EA	\$	\$
39	Penetrations to Existing Precast Manholes	1	EA	\$	\$
<b>Additional Construction</b>					
40	Additional Construction Not Otherwise Covered by Line Items	1	LS	\$	\$
	Stream Crossing	2	LS	\$	\$
41	Soil, Concrete and Materials Testing	Allowance		\$	\$
42	Construction Verification Surveying	Allowance		\$	\$
<b>Extra Items</b>					
43	6" Concrete Encasement	40	LF	\$	\$

BID TOTAL, ITEMS 1 THROUGH 30, INCLUSIVE, THE AMOUNT OF \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ DOLLARS (\$\_\_\_\_\_).

Unit Prices have been computed in accordance with Paragraph 11.03.B 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. Statement of Bidders Qualifications
  - B. Affidavit of No Collusion by Prime Bidder
  - C. Drug-Free Workplace Affidavit
  - D. Iran Divestment Act Compliance Certification
  - E. Attestation Regarding Personnel Used in Contract Performance
  - F. Certification By Proposed Prime or Subcontractor Regarding Equal Employment Opportunity
  - G. Certification Regarding Debarment, Suspension and Other Responsibility Matters

**ARTICLE 8 – DEFINED TERMS**

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

**ARTICLE 9 – BID SUBMITTAL**

9.01 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): \_\_\_\_\_

Date of Qualification to do business in Tennessee is \_\_\_\_\_

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: \_\_\_\_\_

E-mail: \_\_\_\_\_

Submitted on \_\_\_\_\_, 201\_\_.

State Contractor License No. \_\_\_\_\_.

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(800) 548-2723  
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**BID BOND**

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 Chattanooga, Tennessee  
 101 East 11th Street  
 Chattanooga, Tennessee 37402

BID  
 Bid Due Date:  
 Description *(Project Name)*: DuPont Pump Station and Basin Improvements – Phase 2 (Contract B)  
 Contract # W-12-026-203

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** \_\_\_\_\_ (Seal) **SURETY** \_\_\_\_\_ (Seal)

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

By: \_\_\_\_\_ By: \_\_\_\_\_  
 Signature Signature (Attach Power of Attorney)

\_\_\_\_\_ \_\_\_\_\_  
 Print Name Print Name

\_\_\_\_\_ \_\_\_\_\_  
 Title Title

Attest: \_\_\_\_\_ Attest: \_\_\_\_\_  
 Signature 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.

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", 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", 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

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Affidavit of No Collusion by Prime Bidder

CONTRACT NUMBER W-12-026-203
FOR THE CITY OF CHATTANOOGA

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

The undersigned, \_\_\_\_\_, having been duly sworn, deposes and states as follows:

1. I am the \_\_\_\_\_ of \_\_\_\_\_
(sole owner, a partner, president, secretary, etc.) (Name of Corporation/Partnership/Limited Partnership/Joint Venture)

which is a \_\_\_\_\_ in good standing,
(Corporation) (Proprietorship) (Partnership) (Limited Partnership) (Joint Venture)

formed under the laws of \_\_\_\_\_, hereinafter referred to as "Bidder."
(State of incorporation or formation)

2. I am authorized to make this affidavit on behalf of said Bidder, and I have personal knowledge of the matters set forth herein.

3. On \_\_\_\_\_, 201\_\_, said bidder is submitting a bid to the City of Chattanooga for the above captioned contract. This bid was prepared under my personal supervision and direction. During the preparation of the bid, I have taken affirmative steps to inquire about the circumstances of the bid preparation in general and about any contacts between or among this bidder and any other bidders or prospective bidders in particular.

4. I am aware of the Federal and State laws including without limitation, the Sherman Act (15 U.S.C. 1) and the Tennessee antitrust laws (T.C.A. 47-25-101, et seq.), which make it illegal to agree to fix or rig bids or otherwise agree to restrain competition in bidding for contracts with the City of Chattanooga. I am aware in particular that violations of the Sherman Act are federal crimes punishable by a fine of up to \$1.0 million for a corporation, and a fine of up to \$100,000 for an individual or by imprisonment not exceeding three years, or both.

5. I hereby certify and attest that the bid identified in paragraph 3 is based solely upon the independent knowledge, expertise and business judgment of the bidder acting through its officers and agents and is not the product of, nor was it prepared in connection with, any contract, combination, conspiracy, understanding or collusion between or among any other bidder or prospective bidder on said contract.

\_\_\_\_\_
Signature

Subscribed and sworn to me this \_\_\_ day of \_\_\_\_\_, 20\_\_.

NOTARY PUBLIC: \_\_\_\_\_

(name signed)

(name printed or typed)

Commission Expires: \_\_\_\_\_

(Date)

(SEAL)

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Iran Divestment Act Compliance Certification

In accordance with Tennessee Code Annotated (TCA) § 12-12-101 *et. seq.*, by submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to TCA § 12-12-106.

SIGNATURE: \_\_\_\_\_

NAME PRINTED: \_\_\_\_\_

COMPANY: \_\_\_\_\_

DATE: \_\_\_\_\_

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Drug Free Workplace Affidavit of Prime Bidder

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

Comes the affiant after having first been duly sworn and testifies as follows:

1. My name is \_\_\_\_\_ I hold the principal office of \_\_\_\_\_ for \_\_\_\_\_.  
(Name of Principal Office) (Name of Bidding Entity)

2. \_\_\_\_\_ has submitted a bid to the \_\_\_\_\_  
(Name of Bidding Entity)  
City of Chattanooga for the construction of  
**Contract W-12-026-203**  
**DUPONT PUMP STATION AND BASIN IMPROVEMENTS – PHASE 2 (Contract B)**

3. \_\_\_\_\_ employs more than five (5) employees.  
(Name of Bidding Entity)

4. In accordance with Tenn. Code Ann. §50-9-113, this is to certify that \_\_\_\_\_ has in effect at the time of its submission of  
(Name of Bidding Entity)  
a bid to perform the construction of the City of Chattanooga project identified above, a drug-free workplace program that complies with Title 50, Chapter 9 of the Tennessee Code.

5. This affidavit is made on personal knowledge.

\_\_\_\_\_  
Signature

Subscribed and sworn to me this \_\_\_ day of \_\_\_\_\_, 20\_\_.

NOTARY PUBLIC: \_\_\_\_\_  
(name signed)

\_\_\_\_\_  
(name printed or typed)

Commission Expires: \_\_\_\_\_  
(Date)

(SEAL)

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Attestation Regarding Personnel Used in Contract Performance

Project Name: DuPont Pump Station and Basin Improvements – Phase 2 (Contract B)

The Bidder/Contractor, identified below, does hereby attest, certify, warrant, and assure that the Contractor shall not knowingly utilize the services of an illegal immigrant in the performance of this Contract and shall not knowingly utilize the services of any subcontractor who will utilize the services of an illegal immigrant in the performance of this Contract.

BIDDER/CONTRACTOR: \_\_\_\_\_

By: \_\_\_\_\_

*(name signed)*

\_\_\_\_\_

*(name printed or typed)*

Title: \_\_\_\_\_

Date: \_\_\_\_\_

NOTICE: This attestation MUST be signed by an individual empowered to contractually bind the Contractor. If said individual is not the chief executive or president, this document shall attach evidence showing the individual's authority to contractually bind the Contractor.

END OF SECTION

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Section 00 45 77  
Contractor's Identification

**(ALL BLANKS MUST BE FILLED. USE N/A AS NECESSARY)**

This form shall be attached to the sealed envelope containing the Bid. All prime contractors and contractors for electrical, plumbing, and heating, ventilation, and air conditioning contracts for bids of \$25,000 or more and/or masonry items for \$100,000 or more are required to complete this form pursuant to TCA-62-6-119. Failure to provide all of this information on the sealed envelope shall be considered a non-responsive Bid and shall not be opened or shall automatically disqualify such bid.

**BIDDER:**

Name: \_\_\_\_\_  
\_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If TaxID Number (TIN) issued, list below. Otherwise, list Owner's Social Security Number (SSN).

TaxID Number: \_\_\_\_\_

Tennessee License No.: \_\_\_\_\_

License Registration Date: \_\_\_\_\_

License Expiration Date: \_\_\_\_\_

Monetary Limit: \_\_\_\_\_

\_\_\_\_\_ (\$ \_\_\_\_\_)

Classification: \_\_\_\_\_  
\_\_\_\_\_

Complete the following for all applicable Electrical, Plumbing, Masonry and Heating, Ventilation and Air Conditioning Subcontractors: Prime Contractor must fill in space below when performing Electrical, Plumbing, or Heating, Ventilation and Air Conditioning Sub-Contractor work for any bids of \$25,000 or more; and for Masonry for any bids of \$100,000 or more:

**Electrical Subcontractor**

\_\_\_\_\_ Tennessee License No.: \_\_\_\_\_

License Expiration Date: \_\_\_\_\_

License Classification: \_\_\_\_\_

**Plumbing Subcontractor**

\_\_\_\_\_ Tennessee License No.: \_\_\_\_\_

License Expiration Date: \_\_\_\_\_

License Classification: \_\_\_\_\_

**Heating, Ventilation and Air Conditioning Subcontractor**

\_\_\_\_\_ Tennessee License No.: \_\_\_\_\_

License Expiration Date: \_\_\_\_\_

License Classification: \_\_\_\_\_

**Masonry Subcontractor**

\_\_\_\_\_ Tennessee License No.: \_\_\_\_\_

License Expiration Date: \_\_\_\_\_

License Classification: \_\_\_\_\_

CITY OF CHATTANOOGA  
Purchasing Department  
101 E. 11<sup>th</sup> Street, Suite G13  
Chattanooga, Tennessee 37402

**LOCATION:** City Hall, Purchasing Department  
101 E. 11<sup>th</sup> Street  
Suite G13  
Chattanooga, Tennessee 37402

SEALED BID PROPOSAL FOR:

**DUPONT PUMP STATION AND BASIN IMPROVEMENTS  
– PHASE 2 (Contract B)  
Contract Number: W-12-026-203**

**DATE OF BID OPENING: Tuesday, December 17, 2019  
TIME: 2:00 p.m.**

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THIS AGREEMENT is by and between City of Chattanooga, Tennessee ("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:

DuPont Pump Station and Basin Improvements – Phase 2 (Contract B)  
Contract # W-12-026-203

**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:

DuPont Pump Station and Basin Improvements – Phase 2 (Contract B)

**ARTICLE 3 – ENGINEER**

3.01 The Project has been designed by CDM Smith 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 270 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 300 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. 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 \$1,000.00 for each day that expires after the time specified in Paragraph 4.02 above for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1,000.00 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.

## **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.

## **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 on or about the 25<sup>th</sup> day of each month during performance of the Work 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. 95 percent of Work completed (with the balance being retainage); and

b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

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 (pages 1 to \_\_, inclusive).
  - 2. Performance bond (pages \_\_\_\_ to \_\_\_\_, inclusive).
  - 3. Payment bond (pages \_\_\_\_ to \_\_\_\_, inclusive).
  - 4. General Conditions (pages \_\_\_\_ to \_\_\_\_, inclusive).
  - 5. Supplementary Conditions (pages \_\_\_\_ to \_\_\_\_, inclusive).
  - 6. Specifications as listed in the table of contents of the Project Manual.
  - 7. Drawings as listed on the Drawing Index, with each sheet bearing the following general title: DuPont Pump Station and Basin Improvements – Phase 2.
  - 8. Addenda (numbers \_\_\_\_ to \_\_\_\_, inclusive), incorporated herein.
  - 9. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor’s Bid (pages \_\_\_\_ to \_\_\_\_, inclusive).
  - 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).

OWNER:

CONTRACTOR

**City of Chattanooga, Tennessee**

\_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Title: Public Works Administrator

Title: \_\_\_\_\_

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

Attest: \_\_\_\_\_

Attest: \_\_\_\_\_

Title: City Finance Officer

Title: \_\_\_\_\_

Address for giving notices:

Address for giving notices:

City Hall

\_\_\_\_\_

101 East 11<sup>th</sup> Street

\_\_\_\_\_

Chattanooga, Tennessee 37402

\_\_\_\_\_

**CITY FINANCE OFFICER'S CERTIFICATE**

I do hereby certify that the funds required to be paid by the City under this contract have been appropriated or a loan authorized and have been encumbered and will be available as needed for payment.

This \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

\_\_\_\_\_  
City Finance Officer

**CITY ATTORNEY'S APPROVAL**

This contract approved as to form and legality this the \_\_ day of \_\_\_\_\_, 20 \_\_.

\_\_\_\_\_  
City Attorney

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:

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1420 King Street, Alexandria, VA 22314-2794  
(703) 684-2882  
[www.nspe.org](http://www.nspe.org)

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

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

Associated General Contractors of America  
2300 Wilson Boulevard, Suite 400, Arlington, VA 22201-3308  
(703) 548-3118  
[www.agc.org](http://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 Chattanooga, Tennessee  
101 East 11<sup>th</sup> Street  
Chattanooga, Tennessee 37402

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):* DuPont Pump Station and Basin Improvements – Basin 2 (Contract B)  
Contract # W-12-026-203

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)*

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

Attest: \_\_\_\_\_  
Signature

Attest: \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

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

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.

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CONTRACTOR (name and address):

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

OWNER (name and address): City of Chattanooga, Tennessee  
101 East 11th Street  
Chattanooga, Tennessee 37402

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description (name and location): DuPont Pump Station and Basin Improvements – Phase 2 (Contract B)  
Contract # W-12-026-203

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

\_\_\_\_\_ (seal)

Contractor's Name and Corporate Seal

\_\_\_\_\_ (seal)

Surety's Name and Corporate Seal

By: \_\_\_\_\_

Signature

By: \_\_\_\_\_

Signature (attach power of attorney)

\_\_\_\_\_

Print Name

\_\_\_\_\_

Print Name

\_\_\_\_\_

Title

\_\_\_\_\_

Title

Attest: \_\_\_\_\_

Signature

Attest: \_\_\_\_\_

Signature

\_\_\_\_\_

Title

\_\_\_\_\_

Title

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

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

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

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

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

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

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

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Progress Payment Request

**PAY ESTIMATE NUMBER:** \_\_\_\_\_ **PERIOD: FROM** \_\_\_\_\_ **TO** \_\_\_\_\_  
**CONTRACT NUMBER:** \_\_\_\_\_ **RESOLUTION NUMBER:** \_\_\_\_\_

**PROJECT NAME:** \_\_\_\_\_

**SUBMITTED BY:** \_\_\_\_\_

According to the best of our knowledge and belief, we certify that all items and amounts shown on the face of this periodic estimate for partial payment are correct, that all work has been performed and/or materials supplied in full accordance with the requirements of the referenced contract, and/or duly authorized deviations, substitutions, alterations, and/or additions that the foregoing is a true and correct statement of the contract account up to and including the last day of the period covered by this periodic estimate and that no part of the Balance Due this payment has been received.

As per contract specification requirements we understand and agree that the approval of this progress payment shall not be construed as acceptance of any work, material, or products and shall not relieve us in any way from our responsibilities and obligations under this contract, including but not limited to, a final reconciliation of quantities and related costs.

**NET AMOUNT DUE:** \_\_\_\_\_

**CONTRACTOR:** \_\_\_\_\_  
**NAME PRINTED:** \_\_\_\_\_  
**SIGNATURE:** \_\_\_\_\_  
**TITLE:** \_\_\_\_\_  
**DATE:** \_\_\_\_\_

**APPROVALS**

I certify that the above process payment request appears to be accurate and is in general compliance with the amount of work completed during progress payment period.

**REVIEWED BY**

<b>NAME PRINTED:</b>			
<b>SIGNATURE:</b>			
<b>DATE:</b>			
<b>COMPANY:</b>	CDM Smith Inc.	CDM Smith Inc.	Jacobs Engineering Group, Inc.
<b>TITLE:</b>	RPR	Project Manager	Program Manager

**APPROVED FOR PAYMENT**

By: \_\_\_\_\_ DATE: \_\_\_\_\_  
**DIRECTOR OF WASTE RESOURCES DIVISION**

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**

and

Issued and Published Jointly by



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**STANDARD GENERAL CONDITIONS OF THE  
CONSTRUCTION CONTRACT**

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents 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. After issuance, any addenda shall become a part of the specifications, as much as though fully contained therein.

1.1 Administrator—The Administrator, Director or Department Head of the Department of the City of Chattanooga under whose general administration and observation this contract is being performed.

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.

4.1 Award—The formal acceptance of the proposal of the lowest responsible bidder by the City Council, subject to the execution and approval of a satisfactory contract and the required bonds therefor, and following such other conditions as may be specified or otherwise required by law or the purchasing requirements of the City of Chattanooga.

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.

8.1 Bonds-Bid, Performance and Payment Bonds and other instruments of security to be furnished by the Contractor in accordance with the Contract Documents.

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. The document to be executed shall be a Change Request Form (CRF) as included in these Contract Documents.

9.1 City-The City of Chattanooga, Tennessee.

9.2 City Attorney-The person duly authorized by the City to act in the capacity of City Attorney, his authorized designee, or special counsel to the City, acting severally within the scope of the particular duties entrusted to them.

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. Whenever, in any portion of the Contract Documents, a requirement of the Contract is stated, it shall be interpreted to mean a requirement of the Contract Documents as defined herein, unless the context indicates the more restricted definition of that portion of the Contract Documents which is captioned "Contract".

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. Whenever, in any portion of the Contract Documents, the terms "plans and specifications" or "specifications" or "contract" or words of like import appear, they shall be interpreted to mean "Contract Documents" as defined herein unless the context indicates that a more restrictive designation of a particular portion of the Contract Documents is intended.

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 whose proposal is accepted by the Owner with whom Owner has entered into the Agreement; for performance of the work covered by and in conformance with these Contract Documents.

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.~~The City Engineer (or when retained by the City, an architect or engineer, with such entity being named in the Agreement) and his duly authorized assistants, observers, inspectors or administrators acting severally within the scope of the particular duties entrusted to them

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.

23.1 Inspector-An authorized representative of the Engineer assigned to make necessary observations of the work performed by the Contractor.

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 elsewhere in the Contract Documents. 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 City 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 City of Chattanooga, Tennessee. 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.  
31.1 Plan or Plans—All of the drawings pertaining to the contract showing the scope and characteristics of the work or a part thereof, including such supplementary drawings as the Engineer may issue in order to elucidate other drawings or for the purpose of showing the changes in the work or for showing details not shown thereon. The term Plans shall be considered synonymous with the term Drawings.
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 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.
- 41.1 Special Provisions-The special clauses setting forth conditions or requirements peculiar to the specific Project, supplementing the General Conditions and Supplementary Conditions and taking precedence over any condition or requirements of the General Conditions and Supplementary Conditions with which they are in conflict.
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. All Subcontractors shall be deemed to be agents of the Contractor.
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.

47.1 Surety or Sureties—The corporate body which is bound by such bonds as are required with and for the contractor, and which engages to be responsible for the entire and satisfactory fulfillment of the contract and for any and all requirements as set out in the specifications, contract or plans.

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.

52. Working Day. Any day, other than a City holiday pursuant to Chattanooga City Code or Sunday, on which the approximate normal working forces of the Contractor may proceed with regular work for at least six hours toward completion of the work, unless work be suspended for causes beyond the contractor control.

## 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:

- does not conform to the Contract Documents; or
- 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~~~~other~~, 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. The Contractor shall begin the work within ten days of the date of the Notice to Proceed. The Contractor shall notify the City and the Engineer two working days in advance of the date he will begin onsite operations. 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 Section 01 32 16 – Construction Schedules of 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 Section 01 32 16 – Construction Schedules of 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~~ Within 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 Section 01 32 16 – Construction Schedules 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 Section 01 32 16 – Construction Schedules of the General Requirements.
  3. Contractor's Schedule of Values will be acceptable to the Engineer as to form and substance if it is provided in accordance with the requirements specified in Section 01 32 16 – Construction Schedules of 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. Tentative specifications shall be construed as current unless otherwise noted. Where obsolete Federal Specifications have been referenced, they shall be superseded by the Federal Specification in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids).

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
  - 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

l. 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~~

~~3.~~ 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, at his own expense and without liability to the City, for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

D. Prior to the issuance of the Notice to Proceed, the City will have obtained most of the land and rights-of-way, including easements, necessary for carrying out and for the completion of the work to be performed pursuant to these Contract Documents, unless mutually agreed or specified in the Specifications. In the event all land and rights-of-way have not been obtained as herein contemplated before construction begins, the Contractor shall begin the work upon such land and rights-of-way as the City may have previously acquired, and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining land and rights-of-way. Should the City be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of any litigation, or by reason of its inability to procure any lands or rights-of-way for the work, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay, or to withdraw from the contract except by consent of the City; but time for completion of the work will be extended to such time as the City determines will compensate for the time lost by such delay, such determination to be set forth in writing.

#### 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. General

1. The Contractor shall notify the owners of adjacent utilities when the prosecution of the work may affect the utility facilities or operation.
2. The Contractor shall perform and carry on the work so as not to interfere with or damage utility facilities in the vicinity of the work. The Contractor shall take every possible precaution to properly protect and preserve, including temporary supports and bracing where necessary, the utility facilities from damage, injury or displacement. The Contractor shall remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, any subcontractor or any person directly or indirectly employed or engaged by the Contractor or a subcontractor or any person for whose acts the Contractor or a subcontractor is liable.
3. The City and the Engineer will not be responsible for any delay in performing the work resulting from the existence, removal or adjustment of any utility facilities. Additional costs incurred by the Contractor as a result thereof shall be borne solely by the Contractor.
4. Utility facilities, such as water mains, gas mains, storm sewers, sanitary sewers, telephone lines, power lines and buried facilities and structures in the vicinity of the work are indicated

on the drawings only to the extent such information has been made available to or discovered by the Engineer during the course of preparing the drawings. The actual locations of the utility facilities may vary from the locations shown, and there may be utility facilities existing that are not indicated on the Drawings. It is understood and agreed that there is no guarantee as to the accuracy or completeness of the utility information indicated on the drawings, and all responsibility for the accuracy or completeness thereof is expressly disclaimed. Generally, service connections are not indicated on the Drawings.

5. The Contractor shall be solely responsible for locating all existing underground facilities, including service connections, in advance of excavating, trenching or other work, by contacting the owners of the facilities or prospecting. The Contractor shall use his own information and shall not rely upon the information shown on the Drawings concerning utility facilities.
6. In the event of accidental damage to or disruption of utilities by the Contractor or any of his subcontractors or agents, the Contractor shall immediately take all necessary steps to replace any pieces of damaged equipment and all damaged materials, make all necessary repairs and restore all services to normal. The Contractor shall engage any and all required additional labor, individuals, subcontractors or other outside services which may be deemed necessary, to operate on a continuous "around-the-clock" basis until services are restored. He shall also provide and install all required equipment and materials to maintain temporary emergency services for uninterrupted use of facilities. All costs involved in making the repairs and restoring the disrupted service to normal shall be borne by the Contractor responsible for such disruption of services, and he shall be fully responsible for any and all damage claims resulting from such disruption.
7. Under no circumstances shall the Contractor or any of his subcontractors or agents disrupt or disconnect any type of facility whatsoever without first obtaining the written permission of the utility owner to do so. Request for disruption or disconnection shall state:
  - a. The location of the required disconnect and which utility is concerned.
  - b. The exact date and time at which the disconnect will be required.
  - c. The duration of the proposed disconnect or interruption.
8. Where it is necessary to temporarily interrupt services, the Contractor shall notify the utility owner, both before the interruption and again immediately before service is resumed. Before disconnecting any pipes or cables, the Contractor shall obtain permission from the owners thereof, or shall make suitable arrangements for their disconnection by the owners. Where it is necessary to temporarily interrupt house services, the Contractor shall notify the house owner or occupant, both before the interruption and again immediately before service is resumed. Should underground utilities or structures be encountered that are in minor conflict with the alignment or gradient of the proposed work, the proposed work may be adjusted by the Engineer where such adjustment is feasible and will not interfere with the operation of the proposed system. No payment will be made for these adjustments.

9. Where major conflicts in the proposed work and existing utilities or structures occur and adjustment of the new work is not feasible, then the Engineer may revise the alignment and/or grade to suit these conditions. If, in the opinion of the City, these revisions are necessary and are outside the scope of the bid items, they will be paid for as extra work.

**B.** *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.

**BC.** *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 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 caused a change as described in Paragraph A.9 of this Article 4.04. 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~~ by the State of Tennessee 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 Tennessee Department of Commerce and Insurance.
  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. ~~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.~~

B. All policies and bonds shall be subject to approval by the City Attorney. Should the City Attorney at any time in his sole discretion determine that the insurance policies and certificate provided may not be sufficient to protect the interests of the City because of the insolvency of the insurance company or otherwise, the Contractor shall replace such policies with policies meeting his approval.

#### 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 City or Engineer, but not specified, shall be used at the risk and responsibility of the Contractor; and the City 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 City holiday pursuant to the Chattanooga City Code 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 6:00 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 or locally observed national holidays.

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 City.
- 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 work and add to the construction plant when ordered to do so by the Engineer. The Contractor shall obtain written permission from the City prior to constructing temporary buildings or other structures on land owned or leased by the City. If a permit is granted, said buildings or other structures shall comply with all applicable regulations regarding their construction and maintenance and shall be satisfactory to the City

#### 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 Section 01 32 16 – Construction Schedules of 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 Section 01 32 16 – Construction Schedules of 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 Section 01 32 16 – Construction Schedules 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.

#### 6.05 *Substitutes and "Or-Equals"*

- A. See Section 01 25 00 – Substitutions and Options of the 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~~
    - ~~e) 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~~
- ~~e) 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 City 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 50 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 and permanent 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.
- B. **Railway Crossings.** When the work encroaches upon the right-of-way of any railway, the City will secure for the Contractor all the necessary easements or authority to enter upon such right-of-way for the prosecution and completion of the work. Contractor shall, however, take such special precaution for the safety of the work and the traveling public as may be necessary, by sheeting, bracing, and thoroughly supporting the sides of any excavation and supporting and protecting any adjacent structures. Contractor shall be bound by all requirements as stated in Supplemental Agreement between the City and railroad authority, as included in an appendix to these Contract Documents.

#### 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 City 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 City 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 Section 01 78 39 – Record Documents of 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 City 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; he 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. No separate payment will be made for providing lights on vehicles and equipment, signs, barricades, lights, flags, watchmen and other protective devices, and the costs thereof shall be included in the Contract Price(s).

#### 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 willshall be identified as Engineer may require.
1. *Shop Drawings:*
    - a. Submit number of copies specified in the Section 01 33 23 – Shop Drawings, Product Data and Samples of the General Requirements.
    - b. Data shown on the Shop Drawings willshall 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 City 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 City 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 City. 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 City 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 City 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~~s 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.

### 8.13 Testing of Materials and Equipment

- A. The testing of materials shall be made by a competent laboratory or other person selected and paid for by the City. The Contractor shall submit samples of materials for testing as required by the Engineer. 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.

## **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.

#### 9.11 Authority of the City Engineer

- A. If the City has retained an engineer to assist the City Engineer in administering the contract, then the authority of the City Engineer shall be as specified herein. If the administration of the contract is performed by the City Engineer without having an engineer, then the authority of the City Engineer shall be as specified in this section and this Article 9.
- B. The general administration and observation of the performance and execution of the work under these Contract Documents is vested in the City Engineer. The detailed administration and observation of the performance and execution of the work is vested in the Engineer as set forth above.
- C. The City Engineer may authorize a person to act as the City Engineer's authorized representative or agent in carrying out the duties specified in these Contract Documents. The instructions of the City Engineer, or authorized representative, shall be strictly and promptly followed in every case.
- D. The City Engineer, or authorized representative, shall have authority to suspend operations at any time, without additional cost to the Owner, when the work, in the City Engineer's opinion, is not being carried out in conformity with the Drawings, Specifications, and other Contract Documents.
- E. The City Engineer, or authorized representative, may appoint Inspectors as are necessary to observe the performance of the work under these Contract Documents and the amount, character, and quality of materials supplied.

### **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 Request Form, the Owner and Contractor acknowledge and agree that:

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

10.04 *Notification to Surety*

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

10.05 *Claims and Disputes*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than ~~30-10~~ 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 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.

## G. Abnormal Weather Delays

1. Extensions of Contract Time: If, in accordance with this Paragraph 12.03, the basis exists for an extension of time due to delays caused by abnormal weather, then an extension of time on the basis of abnormal weather may be granted only for the number of weather delay days in excess of the number of weather days listed as the Standard Baseline below for that month.

### 2. Standard Baseline for Average Climatic Range

a. The City has reviewed weather data available from the National Oceanic and Atmospheric Administration and determined a Standard Baseline of average climatic range for the State of Tennessee.

b. The Standard Baseline shall be regarded as the normal and anticipated number of calendar days for each month during which construction activity shall be expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is to be included in the work and not eligible for an extension of the contract time.

c. The Standard Baseline, in days, is as follows:

<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>
<u>10</u>	<u>10</u>	<u>10</u>	<u>10</u>	<u>11</u>	<u>8</u>
<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>
<u>11</u>	<u>7</u>	<u>9</u>	<u>8</u>	<u>9</u>	<u>12</u>

### 3. Adverse Weather and Weather Delay Days

a. Adverse weather is defined as the occurrence of one or more of the following conditions which prevents only exterior construction activity or access to the site within a 24-hour period:

1. Precipitation (rain, snow, or ice) in excess of one-tenth inch liquid measure.

2. Temperatures which do not rise above 32 degrees F by 10:00 AM.

3. Standing snow in excess of one inch.

b. Adverse weather days may include, if appropriate, “dry-out” or “mud” days when:

1. Precipitation (rain, snow, or ice) exceeds one-tenth inch liquid measure, and

2. There is a hindrance to site access or site work, such as excavation, backfill, and footings; but

3. May accumulate at a rate no greater than 1 make-up day for each day or consecutive days of rain that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Engineer.

c. An adverse weather day may be counted only if adverse weather prevents work on the project for 50 percent or more of the Contractor's scheduled work day, including a weekend day or holiday if the Contractor has scheduled construction activity that day.

#### 4. Documentation and Submittals

- a. Monthly submit Daily Jobsite Work Log showing which and to what extent construction activities have been affected by weather.
- b. Submit actual weather data to support a claim for the time extension obtained from nearest NOAA weather station or other independently verified source approved by the Engineer at the beginning of the Project.
- c. Maintain a rain gauge, thermometer, and clock at the jobsite. Keep daily records of precipitation, temperature, and the time of each occurrence throughout the Project.
- d. Use the Standard Baseline data provided in this section when documenting actual delays due to weather in excess of the average.
- e. Organize claim and documentation to facilitate evaluation on a basis of calendar month periods, and submit in accordance with the procedures for claims established in Article 10 of these General Conditions.

### **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, 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) willshall 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.

#### E. Retainage Held as Security

1. Notwithstanding any other provision of this Contract to the contrary, in the event the City shall have reasonable grounds to suspect that:
  - (a) The Contractor or associated person has breached the Affidavit of No Collusion contained in these Contract Documents or has breached such an affidavit in any other contract which Contractor may have with City; or
  - (b) The Contractor or associated person has violated or participated in a violation of the Sherman Act (15 U.S.C. Sec. 1-2), or the Racketeer Influenced and Corrupt Organizations Act (18 U.S.C. Sec.1961-1968), or the Hobbs Act (18 U.S.C. Sec. 1951), or the mail or wire fraud statutes (18 U.S.C. Sec. 1341, 1343), the false statements statement (18 U.S.C. Sec. 1001), or other similar provision of Federal or State law in connection with this Contract or with any other contract which the Contractor or associated person has, had, or shall have with the City (including without limitation the submission of bids on such a contract);

then the City shall have the right to withhold and retain any retainage described in this section as security for any damage claim arising from such action.
2. For purposes of this section, the term "associated person" shall include (a) in the case of a corporation: the corporation, its officers, directors, shareholders, employees and agents, and its parents, subsidiaries or affiliates, whether in existence at the time of the violation or subsequently formed or acquired; (b) in the case of a partnership or joint venture: the partnership or joint venture, its general or limited partners and joint venturers, its officers, employees and agents; and (c) in the case of a sole proprietorship: the individual proprietor, and his employees and agents. Where a partner or joint venturer is a corporation, the partnership or joint venture shall have attributed to it the actions of persons attributable to the corporation under paragraph (a) of this subsection.
3. The City shall promptly notify the Contractor in writing of the exercise of its right to retain such amounts.
4. The City shall have the right to retain such funds until the City's damage claims are finally determined. The claim shall be "finally be determined" when a court of competent jurisdiction enters judgment on the merits of any claim made for damages by the City (unless City appeals that judgment, in which event, when the appeal is decided). In the event that City voluntarily waives his damage claim by written instrument signed on City's behalf, then such claim shall be "finally determined" at the time such waiver is effective. City covenants that it will commence an action for damages with respect to its damage claim as soon as

practicable after it exercises its right for retaining such amounts for the causes set forth in this paragraph.

5. In the event such a claim is finally determined in favor of City, any amount of retainage for such claim shall be applied to satisfy the judgment. Any excess of retainage hereunder over the amount of such judgment, or in the event that a damage claim is finally determined in favor of Contractor or its associated person, the amount shall be promptly paid to Contractor, together with interest, at the applicable rate for post-judgment interest set forth in T.C.A. Sec. 47-14-121, provided that interest shall not be paid upon amounts which City could have otherwise properly retained under other provisions of this Contract.

6. Any claim, dispute, or other matter arising out of or relating to City's retention of payment for a damage claim under this section shall not be subject to arbitration. The City's failure to retain all or a portion of any payment due under this Contract pursuant to this section, even if grounds for such retention exists, shall not constitute a waiver of any of City's rights under this section.

#### 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 and Final Acceptance of the Work*

~~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.~~

A. Upon receipt of written notice from the Contractor that all items listed for completion or correction during the inspection for substantial completion have been performed and that the work has been completed in conformity with the Contract Documents, the Engineer shall promptly examine the work, in company with the City, making additional tests and investigations as he may deem proper and using due care and judgment normally exercised in the examination of the completed work by a properly qualified and experienced professional engineer and shall satisfy himself that the Contractor's statement appears to be correct. The Engineer shall then inform the City and, when applicable, regulatory agencies that the work is, in

his opinion, complete in apparent conformity with these Contract Documents and shall schedule the final inspection.

- B. Should the Engineer consider that the work is not finally complete, he will notify the Contractor in writing, stating reasons for his determination. The Contractor shall take immediate steps to remedy the stated deficiencies and/or conditions and, after correction of the deficiencies and/or conditions, send another written notice to the Engineer certifying that the work is complete. The Engineer, in company with the City, will re-inspect the work.
- C. After the final inspection and after the submission by the Contractor items required by these Contract Documents, the Engineer shall notify the City in writing that he has examined the work and that, in his opinion, it appears to conform to these Contract Documents and therefore recommends acceptance of the work and final payment to the Contractor. It is understood and agreed that such statement by the Engineer does not in any way relieve the Contractor or his Sureties from any duties, responsibilities, and obligations under these Contract Documents.
- D. After the Engineer recommends acceptance of the work covered by these Contract Documents and final payment to the Contractor, the City will, if it concurs in the Engineer's recommendation, promptly notify the Contractor in writing that the work is accepted. If the City does not concur in the Engineer's recommendation, the City will promptly notify the Contractor in writing that it does not accept the work as complete and stating the deficiencies and/or conditions that shall be corrected or resolved before final acceptance will be made. After the deficiencies and/or conditions are corrected or resolved and the City is satisfied that the work is complete, the City will notify the Contractor in writing that the work is considered complete and final acceptance is made. The guarantee period(s), as specified in these Contract Documents, shall begin on the date the Contractor is notified by the City that final acceptance of the work is made. Final acceptance of the work by the City will not be made until the Project Record Documents, operation and maintenance data and other required items are acceptable to the City.
- E. It is understood and agreed that said notice of final acceptance or final payment by the City shall not in any way be construed to relieve the Contractor, or his Sureties from any duties, responsibilities or obligations under or in connection with these Contract Documents.

#### 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 Request Form signed by the Contractor to close the Contract;
  - f. certificate of occupancy issued by City of Chattanooga Inspection Department, if buildings are a part of the Project;
  - g. copy of Notice of Completion which had been filed with the appropriate office at the Hamilton County Tennessee Courthouse; and
  - h. 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.~~

14.10 Labor and Material

- A. Contractor shall indemnify and save Owner harmless from all claims growing out of the lawful demands for payment by subcontractors, laborers, workmen, mechanics, material men, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this Contract. Contractor shall, at Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If Contractor fails to do so, then Owner may, after having served written notice on the said Contractor either pay unpaid bills, of which Owner has written notice, direct, or withhold from Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to Contractor shall be resumed, in accordance with the terms

of this Contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon Owner to either Contractor or to Contractor's Surety. In paying any unpaid bills of Contractor, Owner shall be deemed the agent of Contractor and any payment so made by Owner shall be considered as payment made under the Contract by Owner to Contractor and Owner shall not be liable to Contractor for any such payment made in good faith.

#### 14.11 Scope of Payment

A. The Contractor shall accept compensation provided in these Contract Documents as full payment for furnishing all labor, materials, supplies, tools, equipment, taxes, fees, contingencies, and other items necessary or convenient to the completed work and for performing all work contemplated and embraced in these Contract Documents; also for loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the acceptance by the City and for all risks of every description connected with the prosecution of the work; also for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in these Contract Documents; and for completing the work in accordance with these Contract Documents. Neither the payment of any estimate nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material or of any provisions of these Contract Documents.

B. No compensation will be made in any case for loss of anticipated profits.

### **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.

B. The City shall have the authority to suspend the work wholly or in part, for such period as may be necessary, due to unsuitable weather, such other conditions as are considered unfavorable for the suitable prosecution of the work; or due to the failure on the part of the Contractor to carry out orders given, supply sufficient skilled workmen, supply suitable material, prosecute the work satisfactorily and in a workmanlike manner, make prompt payments to Subcontractors or for labor, materials, or equipment, or to perform any obligations or requirements of these Contract Documents. The Contractor shall immediately comply with the written order of the City to suspend the work wholly or in part. The suspended work shall be resumed when conditions are favorable and methods are corrected, as ordered or approved in writing by the City.

C. In the event that a suspension of the work is ordered by the City under Paragraph B above, the Contractor shall, at his expense, do all the work necessary to secure the work and the area affected by the work and to protect all previously completed work as specified herein or as

directed by the City. The suspension of the work by the City shall not relieve the Contractor of any duties, obligations, or responsibilities set forth in these Contract Documents. In the event the Contractor fails to secure and protect the work and area as specified or as ordered, the City will perform, or cause to be performed, all work considered necessary, and the cost thereof will be deducted from monies due or to become due the Contractor under the terms of these Contract Documents.

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 make prompt payments to subcontractors or material suppliers for labor, materials or equipment, or
11. The payment of any compensation, irrespective of its character or form, or the giving of any gratuity, or the granting of any valuable favor, directly or indirectly, by the Contractor to any authorized representative of the City or Engineer.

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 City.

## 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~~

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

### 17.06 *Headings*

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

### 17.07 *Addresses*

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



## 17.08 Forms and Record

- A. The form of all Submittals, notices, change orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the Engineer.
- B. Contractor shall maintain throughout the term of the Contract, complete and accurate records of all Contractor's costs which relate to the work performed, including the extra work, under the terms of the Contract. The Owner, or its authorized representative, shall have the right at any reasonable time to examine and audit the original records.
- C. Records to be maintained and retained by Contractor shall include, but not be limited to:
1. Payroll records accounting for total time distribution of Contractor's employees working full or part time on the work;
  2. Cancelled payroll checks or signed receipts for payroll payments in cash;
  3. Invoices for purchases, receiving and issuing documents, and all other unit inventory records for Contractor's stores, stock, or capital items;
  4. Paid invoices and cancelled checks for materials purchase, subcontractors, and any other third parties' charges;
  5. Original estimate and change order estimate files and detailed worksheets;
  6. All project-related correspondence; and
  7. Subcontractor and supplier change order files (including detailed documentation covering negotiated settlements).
- D. Owner shall also have the right to audit: any other supporting evidence necessary to substantiate charges related to this agreement (both direct and indirect costs, including overhead allocations as they may apply to costs associated with this agreement); and any records necessary to permit evaluation and verification of Contractor compliance with contract requirements and compliance with provisions for pricing change orders, payments, or claims submitted by Contractor or any payees thereof. Contractor shall also be required to include the right to audit provision in the contracts (including those of a lump-sum nature) of all subcontractors, insurance agents, or any other business entity providing goods and services.

## 17.09 Assignment

- A. Contractor shall not assign, 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 Use of Work by City

- A. Prior to substantial completion, the City may use any completed or substantially completed portions of the work, provided that such use will not substantially affect the Contractor's rights and obligations under the contract. It is understood and agreed that said use shall not constitute an acceptance of any such portions of the work.
- B. The City, or another Contractor under contract to the City, shall have the right to enter the premises for the purpose of doing work not covered by these Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the work, or the restoration of any damaged work except such as may be caused by agents, employees, or other contractors of the City.

#### 17.11 Inspection by Public Agencies

- A. Authorized representatives of the Environmental Protection Agency, Department of the Interior, Tennessee Department of Public Health, 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.

#### 17.12 Hindrances and Delays

- A. The Contractor expressly agrees that the construction period named in these Contract Documents includes allowance for all hindrances and delays incident to the work. It is understood and agreed that no claim shall be made by the Contractor for hindrances or delays from any cause during the progress of the work, except as provided otherwise under the terms of these Contract Documents.

#### 17.13 Losses from Natural Causes

- A. It is understood and agreed that all loss or damage arising out of the nature of the work, or from the action of the elements, or from floods or overflows, or from ground water, or from seepage, or from any unusual obstruction or difficulty, or from any other natural or existing circumstance either known or unforeseen, which may be encountered in the prosecution of the work, shall be sustained and borne by the Contractor at his own cost and expense.

#### 17.14 New Job Opportunities

- A. The Contractor shall, to the maximum extent practicable, follow hiring and employment practices that will insure the availability of new job opportunities for unemployed and underemployed persons. The Contractor shall insert, or cause to be inserted, a similar provision in each contract with Subcontractors or Suppliers.

#### 17.15 No Waiver of Legal Rights

- A. Neither the inspection by the City or Engineer or any of their officials, employees, or agents, nor any order by the City or Engineer for payment of money, or any payment for, or acceptance of, the whole or any part of the work by the City or Engineer, nor any extension of time, nor any

possession taken by the City or its employees, shall operate as a waiver of any provision of these Contract Documents, or of any power herein reserved to the City, or any right to damages herein provided, nor shall any waiver of any breach in this Contract be held to be a waiver of any other or subsequent breach.

B. Any waiver of any provisions of these Contract Documents shall be specific, shall apply only to the specified item or matter concerned and shall not apply to other similar or dissimilar items or matters.

#### 17.16 Sewage, Surface, Subsurface and Flood Flows

A. The Contractor shall furnish all necessary equipment, materials and labor, at his expense, for handling, passing and disposing of all sewage, seepage, surface, subsurface and flood flows encountered at any time during the prosecution of the work. It is understood and agreed that the Contractor shall bear all risks associated with said flows; shall indemnify the City and the Engineer from any liabilities resulting from said flows; and shall not make any claim for additional compensation for delays or damage resulting from said flows. The manner of providing for these flows shall be satisfactory to the Engineer and in conformance with all applicable laws and regulations.

#### 17.17 Maintenance of Existing Traffic

A. Satisfactory facilities shall be provided by the Contractor for maintaining public access and travel, and every effort shall be made to reduce any necessary inconveniences to a minimum.

END OF SECTION



These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC C-700 (2007 Edition, with City of Chattanooga Modifications 07-30-13). 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-1.01      *Definitions*

SC-1.01.A.3.      Add the following language to the end of Paragraph 1.01.A.3:

The Application for Payment form to be used on this Project is as included as Section 00 62 76, as supported by additional documentation as may be requested by the Owner or Engineer. The Agency must approve all Applications for Payment before payment is made.

SC-1.01.A.9, Change "... and Owner and authorizes ..." to "... and Owner and Agency and authorizes ..."

SC-1.01.A.9.      Add the following language to the end of Paragraph 1.01.A.9:

The Change Order form to be used on this Project is as included in these Contract Documents. Agency approval is required before Change Orders are effective.

SC-1.01.A.53,      Change "... by Owner upon recommendation ..." to "... by Owner and Agency upon recommendation ..."

SC-2.06      *Preconstruction Conference*

SC-2.06.A, first sentence, Change "... Engineer, and others ..." to "... Engineer, Agency and others ..."

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. No drawings of physical conditions relating to existing surface or subsurface structures at the Site have been used by the Engineer in preparing the Contract Documents.

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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-5.03        *Certificates of Insurance*

SC-5.03, following Paragraph E, add the following,

- F. Copies of endorsements showing that each additional insured identified herein have been added to the policies as an additional insured shall be attached to each of the certificates.
- G. Each insurance certificate for all coverages other than Worker's Compensation Insurance must show that a waiver of rights of recovery against any of the insured or the additional insured is in effect.
- H. Certificate for Worker's Compensation and Employer's Liability coverage must indicate inclusion or exclusion for any proprietor, partner, executive officer or member.

SC-5.04        *Contractor's Insurance*

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

SC-5.04.C, following Paragraph 5.04.B.6.b, Add,

- C. The limits of liability for the insurance required by paragraph 5.04.B.2 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:
  - 1. Worker's compensation, disability benefits and other similar employee benefit acts, and damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees as provided in Paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:
    - a. Workers Compensation: Statutory limits
    - b. Employer's Liability, Each Accident: \$1,000,000
    - c. Employer's Liability, Each Employee: \$1,000,000
    - d. Employer's Liability, Disease – Policy Limit: \$1,000,000
  - 2. Contractor's General Liability Insurance under paragraphs 5.04.A.3 through 5.04.A.5 of the General Conditions shall provide the following minimum limits and conditions:

- a. Each Occurrence: \$1,000,000.
  - b. Damage to Rented Premises (each occurrence) \$100,000.
  - c. Medical Expenses (any one person) \$5,000.
  - d. Personal and Advertising Injury: \$1,000,000.
  - e. General Aggregate: \$2,000,000.
  - f. Products-Completed Operations Aggregate: \$2,000,000.
  - g. Explosion, collapse, and underground coverage shall be included with such indicated on the insurance certificate under General Liability.
  - h. The general aggregate policy limits must be designated to the Project.
  - i. Contractual Liability coverage, as required under Paragraph 5.04.B.3 must be indicated on the insurance certificate under General Liability.
3. Automobile Liability under Paragraph 5.04.A.6 of the General Conditions, providing for Combined Single Limit (each accident) for all owned, hired, and non-owned vehicles: \$1,000,000.
  4. Provide Excess Liability or Umbrella Liability insurance providing protection for at least the hazards insured under the primary liability policies with the following limits:
    - a. General Aggregate: \$5,000,000.
    - b. Each Occurrence: \$5,000,000.

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 City, 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 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 City-furnished equipment, 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 City 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. Overtime rates apply for work defined in labor laws as constituting overtime labor for hourly workers. Rate will be applied at 1.5 times the base hourly rate.

SC-6.13 *Safety and Protection*

SC-6.13 Delete the second sentence of Paragraph 6.13.C.

SC-9.03 *Project Representative*

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

- B. The Resident Project Representative (RPR) will be Engineer's employee or agent at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions. RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall be only through or with the full knowledge and approval of Contractor. The RPR shall:
  1. *Schedules:* Review the progress schedule, schedule of Shop Drawing and Sample submittals, and schedule of values prepared by Contractor and consult with Engineer concerning acceptability.
  2. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.
  3. *Liaison:*
    - a. Serve as Engineer's liaison with Contractor, working principally through Contractor's authorized representative, assist in providing information regarding the intent of the Contract Documents.
    - b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.
    - c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.



4. *Interpretation of Contract Documents:* Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.
5. *Shop Drawings and Samples:*
  - a. Record date of receipt of Samples and approved Shop Drawings.
  - b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.
6. *Modifications:* Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.
7. *Review of Work and Rejection of Defective Work:*
  - a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.
  - b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress will not produce a completed Project that conforms generally to the Contract Documents or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.
8. *Inspections, Tests, and System Startups:*
  - a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.
  - b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.
9. *Records:*
  - a. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.
  - b. Maintain records for use in preparing Project documentation.

- 
10. *Reports:*
- a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and Sample submittals.
  - b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.
  - c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any Hazardous Environmental Condition.
11. *Payment Requests:* Review Applications for Payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
12. *Certificates, Operation and Maintenance Manuals:* During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Specifications to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.
13. *Completion:*
- a. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
  - b. Participate in a final inspection in the company of Engineer, Owner, and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.
  - c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the Notice of Acceptability of the Work.
- C. The RPR shall not:
1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
  2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, Suppliers, or Contractor's superintendent.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.
5. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.
7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.
8. Authorize Owner to occupy the Project in whole or in part.

SC-10.01 *Authorized Changes in the Work*

SC-10.01.A, first sentence, Change "... Owner may, at any time ..." to "... Owner may, subject to written approval by the Agency, at any time ..."

SC-14.02 *Progress Payments*

SC-14.02.A.4. Add the following new Paragraph after Paragraph 14.02.A.3:

4. The Application for Payment form to be used on this Project is EJCDC No. C-620. The Agency must approve all Applications for Payment before payment is made.

SC-14.02.C.1. Delete Paragraph 14.02.C.1 in its entirety and insert the following in its place:

1. The Application for Payment with Engineer's recommendations will be presented to the Owner and Agency for consideration. If both the Owner and Agency find the Application for Payment acceptable, the recommended amount less any reduction under the provisions of Paragraph 14.02.D will become due 30 days after the Application for Payment is presented to the Owner, and the Owner will make payment to the Contractor.

SC-14.02.D.1.c, delete "or"

SC-14.02.D.1.d, change "... 15.02.A." to "... 15.02.A; or"

SC-14.02.D.1, following Paragraph d., Add

- "e. the Contractor's performance or furnishing of the Work is inconsistent with funding Agency requirements."

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

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

<u>Labor Grade</u>	<u>Rate</u>
Vice President or Technical Advisor	\$250
Associate	\$210
Principal	\$190
Senior Professional	
Grade 8	\$190
Grade 7	\$180
Grade 6	\$170
Grade 5	\$160
Grade 4	\$150
Junior Professional	
Grade 3	\$140
Grade 2	\$125
Resident Project Representative	\$100
Technician	\$90
CAD	\$115
Clerical	\$90
Contract Administrator	\$95

SC-14.04 Substantial Completion

SC-14.04.B, first sentence, change "... Owner, Contractor ..." to "... Owner, Agency, Contractor ..."

SC-Article 18, Add Article 18 as follows,

## **ARTICLE 18 -FEDERAL REQUIREMENTS**

### 18.01 Agency Not a Party

- A. This Contract is expected to be funded in part with funds provided by Agency. Neither Agency, nor any of its departments, entities, or employees is a party to this Contract.

### 18.02 Contract Approval

- A. Owner and Contractor will furnish Owner's attorney such evidence as required so that Owner's attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before Owner submits the executed Contract Documents to Agency for approval.
- B. Concurrence by Agency in the award of the Contract is required before the Contract is effective.

### 18.03 Conflict of Interest

- A. Contractor may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer.
- B. Owner's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in Contractor. Owner's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from Contractor or subcontractors.

#### 18.04 Gratuities

- A. If Owner finds after a notice and hearing that Contractor, or any of Contractor's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of Owner or Agency in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, Owner may, by written notice to Contractor, terminate this Contract. Owner may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which Owner bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract.
- B. In the event this Contract is terminated as provided in paragraph 18.04.A, Owner may pursue the same remedies against Contractor as it could pursue in the event of a breach of this Contract by Contractor. As a penalty, in addition to any other damages to which it may be entitled by law, Owner may pursue exemplary damages in an amount (as determined by Owner) which shall not be less than three nor more than ten times the costs Contractor incurs in providing any such gratuities to any such officer or employee.

#### 18.05 Audit and Access to Records

- A. For all negotiated contracts and negotiated modifications (except those of \$10,000 or less), Owner, Agency, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the Contractor, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. Contractor shall maintain all required records for three years after final payment is made and all other pending matters are closed.

#### 18.06 Small, Minority and Women's Businesses

- A. If Contractor intends to let any subcontracts for a portion of the work, Contractor shall take affirmative steps to assure that small, minority and women's businesses are used when possible as sources of supplies, equipment, construction, and services. Affirmative steps shall consist of: (1) including qualified small, minority and women's businesses on solicitation lists;

(2) assuring that small, minority and women's businesses are solicited whenever they are potential sources; (3) dividing total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, and women's businesses; (4) establishing delivery schedules, where the requirements of the work permit, which will encourage participation by small, minority and women's businesses; (5) using the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce; (6) requiring each party to a subcontract to take the affirmative steps of this section; and (7) Contractor is encouraged to procure goods and services from labor surplus area firms.

#### 18.07 Anti-Kickback

- A. Contractor shall comply with the Copeland Anti-Kickback Act (18 USC 874 and 40 USC 276c) as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Buildings or Public Works Financed in Whole or in Part by Loans or Grants of the United States"). The Act provides that Contractor or subcontractor shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. Owner shall report all suspected or reported violations to Agency.

#### 18.08 Clean Air and Pollution Control Acts

- A. If this Contract exceeds \$100,000, Contractor shall comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 USC 7401 *et seq.*) and the Federal Water Pollution Control Act as amended (33 USC 1251 *et seq.*). Contractor will report violations to the Agency and the Regional Office of the EPA.

#### 18.09 State Energy Policy

- A. Contractor shall comply with the Energy Policy and Conservation Act (P.L. 94-163). Mandatory standards and policies relating to energy efficiency, contained in any applicable State Energy Conservation Plan, shall be utilized.

#### 18.10 Equal Opportunity Requirements

- A. If this Contract exceeds \$10,000, Contractor shall comply with Executive Order 11246, "Equal Employment Opportunity," as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and as supplemented by regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."
- B. Contractor's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications, as set forth in 41 CFR Part 60-4 and its

efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting Contractor's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

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

#### 18.11 Restrictions on Lobbying

- A. Contractor and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101-121, Section 319) as supplemented by applicable Agency regulations. This Law applies to the recipients of contracts and subcontracts that exceed \$100,000 at any tier under a Federal loan that exceeds \$150,000 or a Federal grant that exceeds \$100,000. If applicable, Contractor must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 USC 1352. Each tier shall disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Certifications and disclosures are forwarded from tier to tier up to the Owner. Necessary certification and disclosure forms shall be provided by Owner.

#### 18.12 Environmental Requirements

- A. When constructing a project involving trenching and/or other related earth excavations, Contractor shall comply with the following environmental constraints:
  - 1. Wetlands – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or otherwise convert wetlands.
  - 2. Floodplains – When disposing of excess, spoil, or other construction materials on public or private property, Contractor shall not fill in or

otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps, or other appropriate maps, i.e., alluvial soils on NRCS Soil Survey Maps.

3. Historic Preservation – Any excavation by Contractor that uncovers an historical or archaeological artifact shall be immediately reported to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the State Historic Preservation Officer (SHPO).
4. Endangered Species – Contractor shall comply with the Endangered Species Act, which provides for the protection of endangered and/or threatened species and critical habitat. Should any evidence of the presence of endangered and/or threatened species or their critical habitat be brought to the attention of Contractor, Contractor will immediately report this evidence to Owner and a representative of Agency. Construction shall be temporarily halted pending the notification process and further directions issued by Agency after consultation with the U.S. Fish and Wildlife Service.

END OF SECTION



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Equal Employment Opportunities Specifications

Following is the standard language which must be incorporated into all solicitations for offers and bids on all construction contracts or subcontracts in excess of \$10,000 to be performed in designated geographical areas:

"Minority" includes:

- a. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
- b. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
- c. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
- d. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

END OF SECTION

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Equal Employment Opportunity Clause

The City of Chattanooga is an equal opportunity employer and during the performance of this contract, the Contractor agrees to abide by the equal opportunity goals of the City of Chattanooga as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
3. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
4. In all construction contracts or subcontracts in excess of \$10,000 to be performed for the City of Chattanooga, any Contractor and/or subcontractor is further required to file in duplicate within ten (10) days of being notified that it is the lowest responsible bidder, an affirmative action plan with the EEO Director of the City of Chattanooga. This plan shall state the Contractor's goals for minority and women utilization as a percentage of the work force on this Project.
5. This Plan or any attachments thereto shall further provide a list of employees annotated by job function, race and sex who are expected to be utilized on this Project. This plan or attachment thereto shall further describe the methods by which the Contractor or subcontractor will utilize to make good faith efforts at providing employment opportunities for minorities and women.
6. The Contractor will include the portion of the sentence immediately preceding Paragraph 1 and the provisions of Paragraphs 1 through 6 in every subcontract so that such provisions will be requested of each subcontractor. The Contractor agrees to notify the City of Chattanooga of any subcontractor who refuses or fails to comply with these equal opportunity provisions. Any failure or refusal to comply with these provisions by the Contractor and/or subcontractor shall be a breach of this contract.

END OF SECTION

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Contract Name: \_\_\_\_\_

Contract Number: \_\_\_\_\_

## **ESCROW AGREEMENT**

THIS AGREEMENT is entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between the CITY OF CHATTANOOGA (“Project Owner”), \_\_\_\_\_ (“Contractor”), and SUNTRUST BANK, a Georgia state banking corporation (“Bank”) as escrow agent.

### **W I T N E S S E T H:**

WHEREAS, Project Owner and Contractor entered into a construction contract dated \_\_\_\_\_ (the “Contract”). The Contract provides that five percent (5%) of progress payments made under the Contract will be withheld as retainage (“Retainage”) from the total of progress payments made by Project Owner to Contractor; and

WHEREAS, pursuant to T.C.A. § 66-34-104 (the “Statute”), the amount withheld as Retainage is to be deposited in a separate escrow account maintained with a third party, at which time the funds pass out of the control of the Property Owner and shall become the sole and separate property of the Contractor, subject to the terms of this Escrow Agreement; and

WHEREAS, Project Owner and Contractor desire that all Retainage withheld under the Contract, be deposited in an interest bearing escrow account pursuant to and in compliance with the Statute; and

WHEREAS, Bank has agreed to accept the Retainage and cause it to be placed in an interest bearing escrow account and to act as escrow agent for said account.

NOW, THEREFORE, in consideration of the premises and mutual covenants and promises hereinafter set forth, it is agreed as follows:

1. In accordance with the requirements of the Statute, Project Owner shall deposit and the Bank shall hold in an interest bearing escrow account, Account No. \_\_\_\_\_ (“Escrow Account”) all Retainage held pursuant to the Contract.

2. All Retainage withheld from payments to Contractor by Project Owner under the Contract, from this date forward, be deposited in said Escrow Account.

3. The Bank, as escrow agent, shall hold and maintain the Retainage in the Escrow Account until the Bank is presented with a release signed by Project Owner and Contractor, a form of which is attached hereto as Exhibit A, authorizing the disbursement of all or a portion of the funds held on deposit in the Escrow Account plus any accrued interest to Contractor; provided that notwithstanding this Section 3, the Bank may comply with the order of any court of applicable jurisdiction which affects the payment of all or any portion of the funds in the Escrow Account.

The account will use Contractor's tax identification number, and Contractor will furnish the Escrow Agent with a W-9 form for this purpose.

4. In the event of any dispute between the parties resulting in adverse demands being made in connection with this deposit in Escrow, or in the event that any of the parties hereto do not agree as to the disposition of the funds in the Escrow Account, the parties hereto agree that the Bank shall be released of any further obligation under this Agreement by tendering the funds maintained in the Escrow Account into a court of competent jurisdiction in an action in the nature of an interpleader, and the Bank shall have the right to recover its reasonable attorney fees and costs from Project Owner and Contractor, each of whom shall be jointly and severally liable therefor.

5. The Contractor hereto agrees to indemnify and hold Bank harmless from any loss, damages, or liabilities of any kind whatsoever, whether foreseen or unforeseen, whether direct or indirect arising out of or in connection with this Agreement, the Escrow Account and the funds contained therein, or the performance of the Bank's obligations hereunder, except liability resulting from Bank's gross negligence or willful misconduct. The Bank may rely upon the signatures of any correspondence from either or both of Project Owner and/or Contractor as being the authentic signatures of the Project Owner or Contractor or, if the Project Owner or Contractor are not natural persons, of persons duly authorized to act on behalf of the Project Owner or Contractor.

6. The Bank shall not be bound by any modification, amendment, termination, cancellation, rescission or supersession of this Escrow Agreement unless the same shall be in writing and signed by all of the other parties hereto and, hereunder are effected thereby, unless it shall have given prior written consent thereto.

7. The Project Owner and Contractor agree, jointly and severally, to reimburse the Bank for any all costs, damages, expenses or claims, including attorney's fees, which Bank may incur or sustain as a result of or arising out of this Escrow Agreement or Bank's duties relating thereto (except for Bank's willful misconduct or negligence) and will pay them ON DEMAND; and the Bank is hereby given a lien upon, and security interest in, the property deposited in the Escrow Account, to secure Bank's rights to payment or reimbursement.

8. The Bank agrees to provide a statement of the Escrow Account each month to the Project Owner during the term of this Escrow Agreement.

9. The Bank shall receive **no fee** in connection with its rendering of services as escrow agent pursuant to the terms of this Escrow Agreement.

10. The Project Owner and Contractor acknowledge that subject to the rights of Contractor to the Retainage, the Bank maintains a security interest and lien against the Escrow Account and funds contained therein.

11. The Contractor agrees that the Project Owner is not responsible to Contractor for any loss of the Retainage that occurs should Bank be placed in receivership, be taken over by its regulators or otherwise be subject to financial failure.

12. This Escrow Agreement may be executed in three or more counterparts, each of which will be deemed to be an original agreement, but all of which will constitute one and the same document. A counterpart executed by a party and transmitted by facsimile to the other parties will have the same effect as delivery of the original counterpart.

13. This Agreement shall be construed in accordance with the laws of the State of Tennessee without regard to its conflict of law principles.

ENTERED INTO as of the date first above written.

**CONTRACTOR:**

\_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

**PROJECT OWNER:**

**CITY OF CHATTANOOGA**

By: \_\_\_\_\_

Title: \_\_\_\_\_

**BANK:**

**SUNTRUST BANK**

By: \_\_\_\_\_

Title: \_\_\_\_\_



Contract Name: \_\_\_\_\_

Contract Number: \_\_\_\_\_

**EXHIBIT A**

**RELEASE**

The undersigned, City of Chattanooga, as the Project Owner pursuant to a Construction Contract with \_\_\_\_\_ (“Contractor”) dated \_\_\_\_\_ (the “Contract”) hereby certifies that Contractor fully and completely finished all work required of Contractor pursuant to such Contract, except work which may be required pursuant to any guaranty or warranty contained in such Contract, and the undersigned hereby authorizes SunTrust Bank (“Bank”) to release \_\_\_\_\_ (\$\_\_\_\_\_) paid as retainage pursuant to that certain Escrow Agreement between and among the undersigned, City of Chattanooga (“Project Owner”), Contractor, and Bank, and dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, which agreement is specifically incorporated herein by reference.

This release is executed for the sole purpose of releasing the amounts held in escrow as aforesaid and specifically does not, and shall not, be construed to release or otherwise affect any claims or rights which Project Owner has or may have against Contractor pursuant to said contract or the work performed thereunder.

Attest:

**PROJECT OWNER:**

\_\_\_\_\_  
Secretary

**CITY OF CHATTANOOGA**

By: \_\_\_\_\_  
Title: \_\_\_\_\_

STATE OF \_\_\_\_\_  
COUNTY OF \_\_\_\_\_

Affiant makes oath that the above is true, as sworn before me, a Notary Public, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

(SEAL)

\_\_\_\_\_  
Notary Public  
My Commission Expires: \_\_\_\_\_

**APPROVED BY CONTRACTOR:**

\_\_\_\_\_  
By: \_\_\_\_\_  
Title: \_\_\_\_\_

Reference Contract # \_\_\_\_\_

Contract Name: \_\_\_\_\_

### **CORPORATE RESOLUTION**

BE IT RESOLVED, that \_\_\_\_\_, a Tennessee Corporation, hereby authorized and empowers the following Officers:

\_\_\_\_\_

to make, execute and deliver, in behalf of the corporation, unto the CITY OF CHATTANOOGA ("CITY"), its ATTORNEY-IN-FACT, with full power and authority to substitute certain retained funds for securities and take custody of and negotiate said securities at any time and to any extent necessary to cause the contract to be fulfilled. Pursuant to Tenn. Code Ann. § 12-4-108, SUNTRUST BANK shall oversee the safekeeping, custodial care and servicing of securities to the extent necessary to effectuate the purposes of the applicable state law.

BE IT ALSO RESOLVED, that the foregoing resolutions and the authority granted the individuals herein named, shall continue until canceled by delivery to and receipt by CITY, of written notice by a duly authorized representative of the corporation canceling any or all of the foregoing resolutions.

IN WITNESS WHEREOF, I have executed my name as Secretary this \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

Reference Contract # \_\_\_\_\_

Contract Name: \_\_\_\_\_

### LIMITED POWER OF ATTORNEY

Be it known that the undersigned CONTRACTOR \_\_\_\_\_ of the County of \_\_\_\_\_, State of \_\_\_\_\_ hereby makes and appoints the CITY of CHATTANOOGA ("CITY") its true and lawful attorney for specific and limited purposes necessary to empower CITY to substitute certain retained funds for securities consistent with Tenn. Code Ann. § 12-4-108(c) and take custody of the securities and to negotiate said securities at any time and to any extent necessary to cause the contract to be fulfilled in accordance with its provisions.

CITY shall purchase said securities issued by SUNTRUST BANK consistent with CITY's power to enter into a trust agreement with said bank as set forth in Tenn. Code Ann. § 12-4-108(i).

CITY shall perform all acts under this Limited Power of Attorney consistent with the requirements set forth in Tenn. Code Ann. § 12-4-108.

This Limited Power of Attorney is effective upon execution and shall remain in effect until such time of completion of the contract and satisfaction of any statutory obligations with respect thereto.

Signed this \_\_\_\_\_ day of \_\_\_\_\_,  
\_\_\_\_\_

Signature \_\_\_\_\_

Title \_\_\_\_\_

Contract Name: \_\_\_\_\_

Contract Number: \_\_\_\_\_

## New Retainage Escrow Account Set-up Form - Suntrust

(1) Legal Business Name:

(2) Business Address:

(3) TIN (Tax Identification No):

(4) Contact Name:

Telephone:

Email:

(5) Authorized Signer's Name & Title for Retainage Account:

(6) Owner's Names with Titles and Percentages:

(7) Please provide a copy of the following document that applies:

Corporation      Articles of Incorporation

LLC                Operating Agreement & Articles of Organization

Partnership      Partnership Agreement

CITY OF CHATTANOOGA  
 DEPARTMENT OF PUBLIC WORKS  
 ENGINEERING DIVISION  
 1250 Market Street, Suite 2100  
 Chattanooga, TN 37402  
 PHONE: (423) 757-5117 | FAX: (423) 757-0586



CR# \_\_\_\_\_  
 Date Issued: \_\_\_\_\_  
 PO#: \_\_\_\_\_

### CHANGE REQUEST FORM (CRF)

**City Contract No.** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Engineer:** \_\_\_\_\_

**Contractor:** \_\_\_\_\_

---

**Requested By:** \_\_\_\_\_

**Drawing:** \_\_\_\_\_

**Problem Desc:** \_\_\_\_\_

**Revised Scope Description/Details**

<b>Contractor Acknowledgement:</b> No Change in Contract Amount is required.                      A Change in Contract Amount is required: _____ days No Change in Contract Time is required.                      A Change in Contract Time is required: _____	
_____ Architect / Engineer / Inspector / RPR	_____ Contractor
Change in Contract Amount is within the Contingency Amount authorized under Resolution No. _____  Yes            No _____  _____ Engineer / Architect Project Manager	<p style="text-align: center;"><b>Proceed with Execution</b></p> Yes            No _____  _____ City Project Manager



### CHANGE REQUEST FORM (CRF)

**City Contract No.** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

**Engineer:** \_\_\_\_\_

**Contractor:** \_\_\_\_\_

---

**Requested By:** \_\_\_\_\_

**Drawing:** \_\_\_\_\_

**Problem Desc:** \_\_\_\_\_

**Revised Scope Description/Details**

Item No.	Description	Unit	Qty	Unit Price	Item Total
<b>ADD</b>					
<b>DEDUCT</b>					
<b>TOTAL</b>					

**Contractor Acknowledgement:**

No Change in Contract Amount is required.                      A Change in Contract Amount is required: \_\_\_\_\_ days

No Change in Contract Time is required.                      A Change in Contract Time is required: \_\_\_\_\_ days

\_\_\_\_\_ Architect / Engineer / Inspector / RPR                      \_\_\_\_\_ Contractor

<p><b>Change in Contract Amount is within the Contingency Amount authorized under Resolution No. _____</b></p> <p>Yes      No _____</p> <p>_____ Engineer / Architect Project Manager</p>	<p style="text-align: center;"><b>Proceed with Execution</b></p> <p>Yes      No _____</p> <p>_____ City Project Manager</p>
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------

## PART 1 GENERAL

### 1.01 DESCRIPTION

- A. The work to be performed under this Contract shall consist of furnishing all labor, materials, tools, equipment and incidentals to complete the work required on the Drawings and specified herein. The work includes, but is not limited to, the following:
  - 1. Installation of approximately 7,000 linear feet of 48-inch gravity sewer line.
  - 2. Installation of associated manholes and appurtenances.
  - 3. Demolition of the existing DuPont Pump Station.
- B. All work described above shall be performed as shown on the Drawings and as specified.

### 1.02 PROJECT LOCATION

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

### 1.03 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.

### 1.04 PARTIAL OWNER OCCUPANCY

- A. The existing facilities to which these improvements are being made will continue operation during the period of construction. There shall not be any interruption in service. The Contractor is responsible for fines assessed due to Contractor's activities.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SITE CONDITIONS

- A. Several areas of construction under this contract must be coordinated with the Pump Station operation and accomplished in a logical order to maintain the process flow through the Wet Weather Pump Station to allow construction to be completed within the time allowed by Contract Documents. The existing DuPont Pump Station will be maintained in continuous operation by the Owner during the entire construction period.
- B. When access through construction areas must be disrupted, provide alternate acceptable access for the plant operators or other contractors.
- C. Coordinate the activities in the interface or common areas with other contractors and the operators. Submit to the Engineer a description and schedule as to how the common areas will be utilized, recognizing the required coordination with other contractors and the plant operators.
- D. Various interconnections within the scope of work will depend on the closure of various valves and gates. Many of these valves and gates are old and may not seal properly. Coordinate with the Owner and Engineer to request any such closure and provide any corrective measure of temporary facilities necessary to attain the shut off needed to perform the work without interrupting operations.
- E. Various interconnections within the scope of work may require temporary partial power shutdown. Make every effort necessary to minimize the shutdown time and coordinate with the Owner and/or utility authorities prior to attempting any such power shutdown.
- F. When the work requires an existing facility to be taken out of operation, temporarily or permanently, notify the Engineer and plant operators two weeks in advance. Mandatory shutdown and switchover meetings between the Contractor, Owner and Engineer shall be held to review each outage request prior to approval of any outage. The outage request shall include a complete description of work involved, the equipment affected, date and times, duration of outage and include a list of required materials, parts, etc. and that these are on the project site(s).
- G. Where water is required in large quantity for preoperational testing or other use, purchase it from the Tennessee American Water Company. Pay all fees and water usage charges.
- H. During Start Up Testing, make available the manpower, equipment and manufacturer's representatives required to make any necessary adjustments and training.
- I. In addition to the project schedule requirements listed in Section 01 32 16, the Contractor shall develop a detailed description of the complete sequence of construction. The sequence shall be submitted to the Engineer and Owner for review and approval thirty (30) days following the execution of the Contract Agreement.

## 1.02 GENERAL OPERATING REQUIREMENTS, CONSTRAINTS, AND CONSTRUCTION REQUIREMENTS

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

1. An unobstructed traffic route through the site shall be maintained at all times for the Owner's operations and maintenance personnel and equipment. Parking for personal vehicles of construction personnel shall be restricted to approved areas.
2. The Contractor shall provide temporary measures to protect the existing pavement by filling over with earthen material or supplying other measures acceptable to the Engineer. The Contractor shall repair any damage to existing paved surfaces that occurs during the construction period. Any areas disturbed along the shoulders of the access roads and interior roads and elsewhere shall be repaired, graded, seeded, etc. as necessary to match pre-existing conditions.
3. The Contractor shall not undertake the restoration/construction of new roadway (paved, gravel, or asphalt overlay) shown on the Contract Drawings, until all other work improvements has been completed.

### B. Personnel Access

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

### C. Plumbing Facilities

1. Unless otherwise allowed by the Engineer, sanitary facilities in the existing structures shall be operational at all times for plant operating personnel. All other building plumbing systems such as roof and floor drains, pumping, etc., shall be maintained for all structures.

### D. Building Heating and Ventilating

1. Building heating and ventilating for the existing plant structures shall be in service for the entire construction period. Additional temporary heating and ventilation shall be provided as required to maintain facilities under construction adequately heated and vented. The temperatures to be maintained in any areas occupied by plant operating personnel shall be at least 65°F.

### E. Power, Light and Communications Systems (General)

1. Electric power, lighting service and communications systems shall be maintained in uninterrupted operation in all areas which remain in operation. Individual units may be disconnected as required for replacement, but service shall be available

at all times including periods when plant elements are out of service. Shutdown of electrical facilities shall be limited to not more than five (5) hours. The Owner may allow longer outages under conditions determined by the Owner by making use of the existing and/or temporary engine-generator. All costs associated with operation of the engine-generators shall be paid by the Contractor. The Electrical Subcontractor shall coordinate shutdowns required with the Contractor to minimize the total number of shutdowns required to complete construction. Owner's phone service shall be maintained in continuous operation during construction. All power shutdowns and switchovers shall be requested in writing to the Engineer for approval. No shutdown shall compromise Owner operations. Shutdowns shall be limited to the constraints specified herein and as indicated on the drawings. When required by Owner, the Contractor shall restore power and operations during any shutdown in order to maintain pumping requirements.

#### F. Draining Process Pipes and Conduits (General)

1. The contents of all pipes and conduits to be removed, replaced or relocated (or dewatered for a specific purpose) shall be transferred to a suitable facility in a manner approved by the Owner through hoses or piping, or by using pumps if hydraulic conditions so require them. The Contractor shall provide the pumps, piping and hoses at no additional cost to the Owner. No uncontrolled spillage of a pipe or conduit shall be permitted.

#### G. Potable Water System

1. Potable water service shall be maintained in continuous service at all times during construction except for short term interruptions required for tie-ins. Shutdown of the potable water system shall be fully planned and coordinated with the Owner and shall be limited to not more than two (2) hours. Any existing fire hydrants within the site shall be operational at all times.

#### H. Sump Pumps and Sumps

1. All existing sumps shall be maintained in an operable condition with either existing pumps or temporary pumps. Interim piping, power and controls shall be provided as required by the staged construction sequence.

#### I. Seal Water and Service Water Piping

1. A supply of service and seal water and the necessary connections to existing equipment shall be maintained during construction. Interim piping shall be provided as required.

### 1.03 SPECIFIC CONSTRUCTION CONSTRAINTS

- A. The following is a list of constraints to consider in developing the overall plan of construction. This list is not intended to release the Contractor from the responsibility to coordinate the work in any manner which will ensure uninterrupted operation of the Wet Weather Pump Station and project completion within the time allowed. The following

areas are not necessarily listed in their required sequence of construction. A suggested sequence within each area, where necessary, is included.

- B. Currently, the existing 30" force main and 36" gravity sewer shown are shown on the Drawings. The Existing force main and gravity sewer generally flow from east to west.
- C. The Contractor is to install all new structures and equipment to the extent possible without disrupting operations listed in paragraph B above.
- D. Once all structures, equipment, and piping associated with the items listed in paragraph C, including any related plumbing, electrical, and instrumentation equipment, are complete, tested, and ready to be put into service, the Contractor shall notify the Owner and Engineer to schedule a coordination meeting where the sequence of connection to existing structures will be reviewed and discussed.
- E. The existing Dupont pump station shall remain in service until the acceptance of the new facilities. Following acceptance by the Owner and Engineer, the Contractor can proceed with the Demolition of the existing Dupont Pump Station.
- F. Any specific work not listed above that is required for the completion of the project shall be included in the Contractor's proposed scheduled and coordinated with the Owner and Engineer.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

END OF SECTION

## PART 1 GENERAL

### 1.01 PLANT

- A. Furnish material and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the Contract Time. If at any time such material or equipment appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character or increase the material and equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

### 1.02 PRIVATE LAND

- A. Do not enter or occupy private land outside of easements, except by permission of the land owner.

### 1.03 PIPE LOCATIONS

- A. Locate pipelines substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

### 1.04 OPEN EXCAVATIONS

- A. Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. Provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Remove bridges provided for access during construction when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.
- B. Take precautions to prevent injury to the public due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles which could be dangerous to the public at night.

## 1.05 TEST PITS

- A. Excavate test pits, at the direction of the Engineer, to locate underground pipelines or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

## 1.06 MAINTENANCE OF TRAFFIC

- A. Unless permission to close a street is received in writing from the proper authority, place all excavated material so that vehicular and pedestrian traffic may be maintained at all times. If the construction operations cause traffic hazards, repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.
- B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, provide all necessary barricades and signs as required to divert the flow of traffic. Expedite construction operations while traffic is detoured. Periods when traffic is being detoured will be strictly controlled by the Owner.
- C. Take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. Be fully responsible for damage or injuries whether or not police protection has been provided.

## 1.07 CARE AND PROTECTION OF PROPERTY

- A. Be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, restore such property to a condition similar or equal to that existing before the damage was done, or make good the damage in other manner acceptable to the Engineer.

## 1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

- A. Assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations.
- B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines and sewers). Maintain services to buildings and pay costs or charges resulting from damage thereto.

- C. Notify all utility companies in writing at least 72 hours (excluding Saturdays, Sundays and Legal holidays) before excavating in any public way. Also notify Tennessee 811, telephone 811 or 1-800-351-1111 at least 72 hours prior to start of work.
- D. If, in the opinion of the Engineer, permanent relocation of a utility owned by the City of Chattanooga is required, the Engineer or Owner may direct the Contractor, in writing, to perform the work. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under Article 11 of the Supplementary Conditions. If relocation of a privately owned utility is required, the Contractor will notify the Utility to perform the work as expeditiously as possible. Cooperate with the City of Chattanooga and Utility. No claim for delay will be allowed due to such relocation.
- E. Coordinate the removal and replacement of traffic loops and signals, if required for the performance of the work, at no additional cost to the Owner.

## 1.09 WATER FOR CONSTRUCTION PURPOSES

- A. Contractor shall coordinate with Tennessee American Water for water billing meters and water usage permits.

## 1.10 MAINTENANCE OF FLOW

- A. Provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and immediately cart away and remove all offensive matter. Discuss the entire procedure of maintaining existing flow with the Engineer well in advance of the interruption of any flow.

## 1.11 COOPERATION WITHIN THIS CONTRACT

- A. All firms or persons authorized to perform any work under this Contract shall cooperate with Contractor and Subcontractors or trades and assist in incorporating the work of other trades where necessary or required.
- B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

## 1.12 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

- A. During the course of the work, keep the site of operations as clean and neat as possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.
- B. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related sections.

- C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

END OF SECTION



## PART 1 GENERAL

### 1.01 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.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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 and Specifications.

### 1.02 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 documented field measurements. 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.

### 1.03 GENERAL

- A. No separate payment shall be made for clearing and constructing access roads to sewers.
- 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.
- C. No separate payment shall be made for the cost incurred to repair damaged property. This includes concrete or asphalt driveways, except where payment is authorized for Same Trench Sewer Replacement.
- D. Construction Along Highways, Streets and Roadways: No separate payment shall be made for traffic control or maintaining highways, streets, roadways and driveways.
- E. No additional payment will be made for replacement of defective materials.
- F. All costs related to the implementation of the easement and permit stipulations shall be included in the unit price bid for the item to which it pertains.
- G. No separate payment will be made for clean-up. Any cost for labor, materials and equipment required for clean-up shall be included in the unit price bid for the item to which it pertains.
- H. 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.
- I. No separate payment will be made for by-pass pumping.

### 1.04 EROSION AND SEDIMENTATION CONTROL

- A. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls or replacement of landscaping disturbed by inspection, replacement or rehabilitation activities. All temporary and/or permanent erosion and sedimentation control costs shall be included in the unit price bid for the item to which it pertains.
- B. No payment will be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.

### 1.05 SEWER INSTALLATION AND REPLACEMENT

- 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 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. No payment will be made for relocation of existing utilities.
- B. Location and Grade: No separate payment shall be made for survey work performed by or for the Contractor in the establishment of reference points, bench marks, limits of right-of-way or easement, including their restoration, as well as centerline or baseline points.
- C. 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.
- D. Sheeting, Bracing and Shoring: No separate payment will be made for providing any sheeting, bracing and shoring.
- E. Rock Excavation: No separate payment will be made for rock excavation. The cost of such work and all associated costs shall be included in the unit price for the item to which it pertains.
- F. 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.
- G. Trench 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 filter fabric.
- H. Bedding and Haunching

1. The unit price bid for pipe for gravity sewer shall include excavation of the trench to the depth below the pipe necessary to provide specified bedding and to lay the sewer to grade.
  2. No additional payment will be made for additional trench depth.
  3. 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.
  4. No additional payment will be made for improved bedding required to compensate for over excavation of the trench.
- I. 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 material if the insitu material cannot meet the compaction requirements.
- 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 material if the insitu material cannot meet the compaction requirements.
- K. Additional Material: No separate payment will be made for additional earth or fill materials imported to the Project site.
- L. No separate payment shall be made for detection tape or tracing wire.
- M. No payment will be made for cutting and beveling pipe.
- N. Concrete Encasement: Payment for concrete encasement shall be at the unit price in the bid.

## 1.06 PRECAST CONCRETE MANHOLE REPLACEMENT

- A. Measurement for payment at the unit price for manholes shall be made on a unit quantity basis.
- B. Payment for precast concrete manhole replacement shall include all penetrations for influent and effluent pipelines regardless of diameter.
- C. No separate or additional payment will be made for testing, bedding, connecting pipes to manholes, constructing invert, plugging abandoned pipes, risers or frame and cover.

## 1.07 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, density tests, concrete tests, cured-in-place pipe samples and any other samples required for testing.
  - 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. Soil, Concrete and Materials 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 and testing physical properties of manhole lining materials.

2. Construction Verification Surveying
  - a. Allow the amount provided in the Bid for construction surveying by an independent surveying firm, selected by the Owner, to perform horizontal and vertical alignment checks at the discretion of the Engineer.
  - b. This 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.

END OF SECTION



## PART 1 GENERAL

### 1.01 SCOPE

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

### 1.02 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.

### 1.03 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 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.

#### 1.04 APPROVALS

- A. 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.

#### 1.05 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 23.
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.

3. If the term “or equal” follows the names of acceptable manufacturers, then other manufacturers desiring approval as an acceptable manufacturer may submit the product information to the Engineer for approval during the bidding phase, as indicated below. With the exception of where the phrase “no substitutions” is associated with a list of manufacturers, where a list of acceptable manufacturers is not preceded by the phrase “equal to”, the list of acceptable manufacturers shall be considered as having the phrase “or equal” following the list, and the list being subject to the “or equal” provisions of this section.
4. The manufacturer shall include the following items in its “or equal” submittal:
  - a. Descriptive literature including information on materials used, minimum design standards, standard design features, manufacturing processes and facilities, and similar information which will indicate experience and expertise in the manufacture of the product being evaluated.
  - b. Performance specifications applicable to the manufacturer's standard design which indicates the level of performance to be expected from the product.
  - c. A complete set of submittal drawings of similar products which have been completed and placed into operation.
  - d. A list of existing installations of products similar in type and size, information required to satisfy specified experience requirements, or a copy of the bond to be submitted in lieu of experience.
  - e. Evidence of technical ability of the manufacturer to design and manufacture products meeting Project requirements.
  - f. Evidence submitted shall include, as a minimum, descriptions of engineering and manufacturing staff capabilities.
  - g. A copy of the manufacturer's most recent annual business report. Include a statement comparing the present net worth of the manufacturer in comparison to the total value of all products proposed to be furnished. Net worth must exceed the total value of all products proposed.
  - h. A complete description of field service capabilities, including the location of field service facilities which would serve the proposed facility and the number and qualifications of personnel working from that location.
  - i. A complete list of all requirements of the Drawings and Specifications with which the manufacturer cannot conform, including reasons why alternate features are considered equivalent.
  - j. If descriptive literature or drawings illustrate standard products with design features or materials not in compliance with Project requirements then these exceptions must be specifically listed. Failure to do so will indicate intent by the manufacturer to modify design features and alter materials to meet Project requirements.
  - k. Where additional information is submitted to supplement the submittal, all changes to the list of exceptions shall be specifically noted.
  - l. All other information necessary to fully evaluate the product for consideration.
5. This “or equal” submittal shall reach the Engineer no later than 14 days prior to the Bid date. Submittals which do not include a complete list of exceptions to Project requirements, or the statement “No exceptions to the Specifications will be taken”, will automatically be rejected by the Engineer. Manufacturers will be

advised of approval or rejection in writing no later than 10 days prior to the Bid date. Rejected submittals may be supplemented with additional information and resubmitted no later than five days prior to the Bid date. Manufacturers making supplementary submittals will be advised of approval or rejection in writing no later than two days prior to the Bid date.

6. Bids based on products which have not received the approval of the Engineer may be determined non-responsive by the Owner and rejected.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE

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

### 1.02 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.

### 1.03 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.
- G. The value of the work associated with conducting the Operating Test Period shall be provided for the Project.

END OF SECTION

## PART 1 GENERAL

### 1.01 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.

### 1.02 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.

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.

### 1.03 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.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE

- A. The work under this Section includes 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.

### 1.02 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.

### 1.03 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.

### 1.04 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.

## 1.05 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.

## 1.06 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 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.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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. The requirements of this section are independent of and in addition to the requirements in Division 31 of the Specifications.
- 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.

### 1.02 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.

### 1.03 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 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.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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 24 x 36-inches.
    - e. Minimum detail sheet size shall be 8-1/2 x 11-inches.
    - f. Minimum Scale:
      - 1) Assembly Drawings Sheet, Scale: 1-inch = 30 feet.
      - 2) Detail Sheet, Scale: 1/4-inch = 1 foot.
  - 2. Product Data
    - a. Product data 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.

## 1.02 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.

### 1.03 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

### 2.01 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 three hard copies of all shop assembly drawings larger than 11 x 17-inches. Additional copies shall be made available upon request.
- C. Submit all shop drawings, 11 x 17-inches and smaller, in the form of six hard copies.
- D. One reproducible for all submittals larger than 11 x 17-inches and no more than three prints of other submittals will be returned to the Contractor.

## 2.02 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.

## 2.03 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.

## 2.04 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

## 3.01 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.

### 3.02 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.

### 3.03 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 - See Remarks" 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 - See Remarks" 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.

### 3.04 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

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## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to construction activity in that area. Specific requirements for erosion and sedimentation controls are specified in Section 31 25 00.
- D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Tennessee Department of Environmental Health.

### 1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

### 1.03 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. After receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an

order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

## 1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer and Owner or Owner's representative to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

### 3.02 PROTECTION OF STREAMS AND SURFACE WATERS

- A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.
- B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action approved by the Tennessee Department of Environmental Health. Submit two copies of approved contingency plans to the Engineer.

- D. Water being flushed from structures or pipelines after disinfection, with a Cl<sub>2</sub> residue exceeding standards set forth by the Tennessee Department of Environmental Health for the classification for the adjacent stream shall be treated with a dechlorination solution, in a method approved by the Engineer, prior to discharge.

### 3.03 PROTECTION OF LAND RESOURCES

- A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.
- D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.
  - 1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
  - 2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.
- E. The locations of the Contractor's storage and other construction buildings required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.

- F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.
1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.
  2. Details of temporary road construction.
  3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
  4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.
- G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. 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 disturbed areas shall be prepared and seeded as described in Section 32 92 19, or as approved by the Engineer.
- H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

### 3.04 PROTECTION OF AIR QUALITY

- A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others. See Section 01 56 16.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient

competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

### 3.05 NOISE CONTROL

- A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

### 3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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 1.02.

### 1.02 STANDARD ORGANIZATIONS

#### A. Piping and Valves

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

## B. Materials

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

## C. Painting and Surface Preparation

NACE	National Association of Corrosion Engineers
SSPC	Steel Structures Painting Council

## D. 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

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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
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	Tennessee 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

### 1.03 SYMBOLS

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

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE

- A. The work under this Section defines the minimum scope of services to be provided by the Contractor during installation, start-up, operating test period, and operator training using factory representatives of the manufacturers of the equipment provided.
- B. Furnish all labor, materials, tools, equipment, and services for the cleaning up or preparation of all equipment which is required in conjunction with the instruction work to be performed for the Owner's personnel.
- C. Perform additional instruction of the Owner's personnel for any and all items of work that are incomplete at the time initial instruction sessions are scheduled.
- D. Although such work may not be explicitly specifically indicated elsewhere, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation, and to provide instructions upon the functions of that installation.
- E. Provide instruction for all equipment and systems for which operating and maintenance data is required.
- F. Instruction sessions may be combined to some extent between several pieces of similar equipment within the same training session, but only if that combination is defined in the Contractor's instruction program submittal and approved by the Engineer.
- G. One instruction session for each major type of equipment will be required. The Contractor shall anticipate that up to ten of the Owner's employees will participate in any particular instruction session, and shall be prepared to provide the required number of handouts, manuals, and tools for each session.

### 1.02 QUALIFICATION

- A. Qualification of the manufacturer's representatives for installation, start-up, and operator training purposes shall be appropriate for the equipment being installed. Manufacturer's representatives shall be subject to the approval of the Engineer. Where equipment has significant process complexity, furnish the services of engineering personnel knowledgeable in the process involved and the function of the equipment.
- B. References in various equipment sections of the terms "factory representative" or "field representative" shall mean an employee of the equipment manufacturer who is completely knowledgeable of the manufacturing, installation, operation and maintenance of the equipment. A sales representative does not qualify, unless it is documented that they have been specifically trained by the Manufacturer. Any field or factory representative not an active employee of the manufacturer must provide documentation from the manufacturer stating that the individual, by name, has been

formally trained in the installation, operation and maintenance of the equipment and is authorized to make the required certification to perform the required services.

### 1.03 SUBMITTALS

- A. No later than one hundred twenty days prior to scheduled Substantial Completion of the Work, the Contractor shall submit a list of proposed instruction sessions for the entire Project. This list shall be organized by Specification Section and its contents will be subject to the approval of the Engineer and Owner.
- B. After approval of the list of the proposed instruction sessions and no later than sixty days prior to the scheduled Substantial Completion of the Work, submit course outlines and training material for each of the approved instruction sessions. Outlines shall be organized by Specification Section, and their contents shall be subject to the approval of the Engineer.
- C. After approval of the program content, the Contractor shall submit a proposed schedule for each of the approved instruction sessions which are to be organized by Specification Section, and the scheduled dates will be subject to the approval of the Engineer.
- D. Submit a separate instruction request/report (form attached) for each system or type of equipment, subject to the Owner's approval of availability of personnel.
  - 1. Submit request/report with preliminary information indicated, to the Engineer at least two weeks prior to first instruction period.
  - 2. After each instruction session, submit three copies of the completed report to the Engineer.

### 1.04 COORDINATION

- A. Do not begin instructions until component assembly or system has been tested as specified in Section 01 75 16 and is in satisfactory operating condition.
- B. Prior to instruction sessions, assemble instructional aids, tools, test equipment, and "Final" copies of Operations and Maintenance Manuals.
- C. All instruction sessions shall be planned and scheduled such that the Owner's participants will utilize copies of the Project Operations and Maintenance Manuals which will have been previously provided. These copies are in addition to the quantities which have to be provided to the Owner under Section 01 78 23. The use of draft copies of these manuals will be acceptable.
- D. The Contractor shall schedule and coordinate the visits of factory representatives during installation, start-up and operator training in accordance with the requirements of Section 01 75 16 of these Specifications.
- E. The Contractor shall notify the Engineer 72 hours prior to any impending visit by factory representatives so that the Engineer can be present.



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## 1.05 INSTALLATION, START-UP AND TESTING SERVICES

- A. The Contractor shall furnish the services of a factory representative to provide the Pre-Start-Up Maintenance, Installation, Inspection, Functional Testing, and Operational Testing in accordance with Section 01 75 16 and the equipment sections of these Specifications.

## 1.06 OPERATOR TRAINING SERVICES

- A. Provide all instruction as required to ensure understanding of all operating and maintenance procedures by the Owner designated personnel.
- B. Instruct Owner's personnel in operation and maintenance of equipment and systems. Provide all necessary instruction to satisfaction of the Owner.
- C. Training sessions shall be scheduled at the convenience of the Owner, and may have to be scheduled outside of the Contractor's normal working hours.
- D. Explain use of Operating and Maintenance Manuals.
- E. Tour building areas involved and identify:
  - 1. Maintenance and access points.
  - 2. Control locations and control equipment.
- F. Explain Operating Sequences
  - 1. Identify location and show operation of switches, valves, etc., used to start, stop, and adjust systems.
  - 2. Explain use of flow diagrams, operating sequences, diagrams, etc.
  - 3. Demonstrate operation through complete cycle(s) and full range of operation in all modes, including testing and adjusting relevant to operation
- G. Explain use of control equipment, including temperature settings, switch modes, available adjustments, reading of gauges, and functions that must be serviced only by authorized factory representative.
- H. Explain Trouble Shooting Procedures
  - 1. Demonstrate commonly occurring problems.
  - 2. Note procedures which must be performed by factory personnel.
- I. Explain Maintenance Procedures and Requirements
  - 1. Point out items requiring periodic maintenance.

2. Demonstrate typical preventive maintenance procedures and recommend typical maintenance intervals.
  3. Demonstrate other commonly occurring maintenance procedures not part of preventive maintenance program.
  4. Identify maintenance materials to be used.
- J. Furnish all tools and/or test equipment required for proper instruction of the Owner's personnel. Tools and/or test equipment shall be distributed in "sets" with each two participants having a "set" to work with and retain upon completion of the instruction. Each participant shall sign for their tools at the start of the instruction session, and copies of the assignment documents shall be provided to the Construction Manager by the Contractor.
- K. Thirty-day operating period after start-up: The manufacturers' representative for each piece of equipment shall return to the Project site 30 days after successful completion of the operating test to review the equipment performance, correct any equipment problems, and conduct follow-up operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of manufacturer's representative prior to and during equipment start-up. At this time, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the certification is accepted by the Engineer and Owner, the warranty period for that piece of equipment shall be considered to have begun as of the start-up date. If the equipment is operating incorrectly, the factory representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful 30 days operating period. At the conclusion of that period, the warranty start date will be decided upon by the Owner.
- L. Six-month operating period after start-up: The manufacturer's representative for each piece of equipment shall return to the Project site six months after the successful completion of the operating test to review the equipment performance, correct any equipment problems, and conduct follow-up operation and maintenance classes as required by the Owner. This follow-up trip is required in addition to the specified services of manufacturer's representative prior to and during equipment start-up. At the time of this trip, if there are no equipment problems, each manufacturer shall certify to the Owner in writing that his equipment is fully operational and capable of meeting operating requirements. If the equipment is operating incorrectly, the service representative will make no certification to the Owner until the problems are corrected and the equipment demonstrates a successful 30-day operating period after problems are corrected.

## 1.07 DOCUMENTATION

- A. The Contractor shall provide for the services of an experienced professional audio-visual firm to record on digital video all operators instruction(s), training sessions, and seminar(s), both initial and follow-up sessions. Videos shall incorporate professionally produced graphic elements and other animation to ensure the trainings are compelling and dynamic. Video shall be edited to fit an educational/training format using cutaways and other techniques to reinforce the trainer's dialogue and

message. The audio-video firm shall have the appropriate technical resources on staff to edit the videos consistent with the engineering aspects appropriate to the specified equipment. Equipment vendors shall provide drawings and/or other visual aids in electronic format to the audio-video firm. Video quality will be equivalent to that provided by the firms of Cool New Media (James Cool 404-702-5743) or approved equal. The Contractor shall fully inform all subcontractors, suppliers, and manufacturers of the requirement prior to award of any subcontracts. To the greatest extent possible, the training sessions and corresponding videos shall be conducted and documented individually by equipment type.

- B. The Contractor shall obtain from all manufacturers an electronic file of all operation and training information and training presentation materials in searchable Adobe Acrobat Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. File(s) shall be identified by specification section. All documents shall be scanned at 300dpi or greater utilizing optical character recognition (OCR) software. All text in the document must be text selectable with the exception of pages which are in their entirety drawings or diagrams. Word searches of the PDF document must function successfully. PDF files that fail to comply with the indexing and searchable features described above will not be acceptable.
- C. Contractor shall submit a draft copy of the video in DVD minus R format to the Engineer for review prior to making copies of the training sessions. Tape will be reviewed for sound, lighting, and tape quality.
- D. Once approved, Contractor shall provide the Owner six copies of the video for each occasion and/or each piece of equipment. The video shall be properly labeled and logged as per its contents. Contractor shall provide the video along with a release from the manufacturer authorizing unlimited use of the videos by the Owner.
- E. Compact disk copies shall be in the DVD(-R) format.
- F. At the completion of each training session, the training session will be certified by representatives from the Manufacturer, Contractor, Owner and Engineer. A training attendance roster for each session identifying all participants shall be delivered by the Contractor to the Engineer.

END OF SECTION

EQUIPMENT AND SYSTEMS INSTRUCTION REPORT

PROJECT: \_\_\_\_\_

SYSTEM OR EQUIPMENT: \_\_\_\_\_

CONTRACTOR NAME: \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_

SPECIFICATION SECTION

NOTE: The Contractor's Representative must maintain and complete this report during instruction.

\_\_\_\_\_

PRELIMINARY INFORMATION

1. To be completed by the Contractor:

A. Proposed dates for instruction period: From \_\_\_\_\_ To \_\_\_\_\_

B. Name of Representative Instructor: \_\_\_\_\_

C. Approximate number of hours of training required: \_\_\_\_\_

2. To be completed by the Owner:

A. Owner's Designated Personnel to receive instruction: (Identify supervisor, if required).

- |          |           |
|----------|-----------|
| 1) _____ | 6) _____  |
| 2) _____ | 7) _____  |
| 3) _____ | 8) _____  |
| 4) _____ | 9) _____  |
| 5) _____ | 10) _____ |

B. Training Session Location: \_\_\_\_\_  
\_\_\_\_\_

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RECORD INFORMATION (To be Completed after Instruction Session)

Instructor's Signature: \_\_\_\_\_ Date Instruction Completed: \_\_\_\_\_

Construction Managers Signature: \_\_\_\_\_

Owner's Signature: \_\_\_\_\_

SPECIAL CONSIDERATIONS/NOTES:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and test and clean all new pipelines installed under this Contract as specified herein.

### 1.02 RELATED WORK

- A. Buried pipelines are included in Division 33.
- B. Above grade and exposed pipelines are included in Division 40.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Furnish all necessary equipment and labor for cleaning and testing the pipelines. The procedures and methods shall be approved by the Engineer.
- B. Make any taps and furnish all necessary caps, plugs, etc, as required in conjunction with testing pipelines. Furnish a test pump, gauges and any other equipment required in conjunction with carrying out the hydrostatic tests.

### 3.02 CLEANING PIPELINES

- A. As pipe laying progresses and at the conclusion of the work thoroughly clean all new pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

### 3.03 TESTING GRAVITY PIPELINES

- A. All gravity pipelines shall be tested for leakage by an infiltration or exfiltration test. Buried piping shall be tested by an infiltration test if the groundwater is more than 2-ft above the crown of the pipe for the full length of the section to be tested. Air testing may be used in lieu of an exfiltration test subject to approval of the Engineer.
- B. Exfiltration Test
  - 1. Leakage tests by exfiltration shall be made by creating a head in the pipeline to be tested by filling the line and either a manhole or temporary riser on one end of the line with water. The length of pipe to be tested shall be such that the head over the crown at the upstream end is not less than 2-ft and the head over

the downstream crown is not more than 6-ft. The pipe shall be plugged by pneumatic bags or mechanical plugs in such a manner that the air can be released from the pipe while it is being filled with water. Before any measurements are made, the pipe shall be kept full of water long enough to allow absorption and the escape of any trapped air to take place. Following this, a test period of at least one hour shall begin. Provisions shall be made for measuring the amount of water required to maintain the water at a constant level during the test period.

2. If any joint shows an appreciable amount of leakage, the jointing material shall be removed and the joint repaired. If any pipe is defective, it shall be removed and replaced. If the quantity of water required to maintain a constant head in the pipe does not exceed 1.9 gallons per inch of diameter per day per 100-ft of pipe and if all the leakage is not confined to a few joints, workmanship shall be considered satisfactory.

C. Infiltration Test

1. Pipe shall be tested for infiltration after the backfill has been placed and the ground water allowed to return to normal elevation. The length of line to be tested shall be not less than the length between adjacent manholes and not more than the total length of each size of pipe. The allowable infiltration shall be 1.9 gallons per inch of diameter per day per 100-ft of pipe in each section tested. There shall be no gushing or spurting leaks.
2. If an inspection of the completed pipeline or any part thereof shows pipes or joints which allow noticeable infiltration of water, the defective work or material shall be replaced or repaired as directed.
3. Rates of infiltration shall be determined by means of V-notch weirs, pipe spigots, or by plugs in the end of the pipe installed in an approved manner and at such times and locations as may be directed by the Engineer.

D. When the pipeline to be tested is reinforced concrete pipe, the allowable leakage in the above tests shall be 4.7 gallons per inch of diameter per 100-ft of pipe.

E. Low Pressure Air Test

1. Low-pressure air tests shall be made with equipment specifically designed and manufactured for the purpose of testing pipelines using low-pressure air. The equipment shall be provided with an air regulator valve or air safety valve so set that the internal air pressure in the pipeline cannot exceed 8 psig. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. All air used shall pass through a single control panel.
2. Install plugs at manholes. Brace plugs securely as required for safety and allow no one in the manholes while pressurizing the line or during the test.
3. Low-pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psig. The internal air pressure in the sealed line shall not be

allowed to exceed 8 psig. At least 2 minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period, the low-pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig shall not be less than that shown in applicable ASTM references.

4. If the pipe section does not pass the air test, sectionalize the section tested to determine the location of the leak. Once the leak has been located, repair and retest.

### 3.04 TESTING PRESSURE PIPELINES

- A. All pressure pipelines shall be pressure and leakage tested. Pipelines shall be subjected to a hydrostatic pressure of 50 percent above the normal operating pressure and this pressure maintained for at least 10 minutes. The leakage test shall be conducted at the maximum operating pressure as determined by the Engineer, and this pressure shall be maintained for at least two hours. The test pump and water supply shall be arranged to allow accurate measurement of the water required to maintain the test pressure. Where applicable, hydrant branch gate valves shall remain open during this test. The amount of leakage which will be permitted shall be in accordance with AWWA C600.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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.

### 1.02 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.

### 1.03 LABORATORY DUTIES

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

- D. Promptly notify the Engineer and Contractor of 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.

#### 1.04 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.

## 1.05 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).

## 1.06 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.

## 1.07 FURNISHING MATERIALS

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

## 1.08 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.

## 1.09 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.

END OF SECTION

## PART 1 GENERAL

### 1.01 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.

### 1.02 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.

### 1.03 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.
- B. Temporary Water: Provide all necessary temporary piping, back flow preventers, meters and upon completion of the work, remove all such temporary facilities. Coordinate with Tennessee American Water to acquire billing meter and usage permit.
- C. Temporary Electricity

1. Provide all necessary wiring for the Contractor's use.
2. 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.

#### 1.04 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 Engineer's personnel.

#### 1.05 SANITARY FACILITIES

- A. 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. 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 Engineer's review and maintenance of same must be satisfactory to the Engineer at all times.

#### 1.06 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.

#### 1.07 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.

#### 1.08 PARKING FACILITIES

- A. Parking facilities for the Contractor's and Contractor's subcontractors' personnel shall be the Contractor's responsibility. The storage and work facilities provided by the Owner will not be used for parking by the Contractor's or subcontractor's personnel.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE

- A. This Section covers furnishing, maintaining, and operating a temporary bypass pumping system during construction. The Contractor shall furnish all materials, labor, equipment, power, maintenance, etc., to implement a temporary pumping and control system for the purpose of diverting the existing flow around the work area.
- B. Design and installation of these systems shall be the Contractor's responsibility subject to Engineer's approval as specified.

### 1.02 GENERAL

- A. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The Contractor shall provide at least five references of projects of a similar size and complexity as this Project performed by his company within the past three years where bypass pumping was implemented. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

### 1.03 SUBMITTALS

- A. The Contractor shall prepare a specific, detailed description of the proposed pumping system(s) required for each location and submit it along with previous bypass pumping project references within one month following Notice to Proceed.
- B. The Contractor shall submit detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows in accordance with the submittal section. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, pump and drive control selection and design, materials and all other incidental items necessary and/or required to insure proper protection of the facilities. The plan shall include but not be limited to details of the following:
  - 1. Staging areas for pumps.
  - 2. Sewer or structure plugging method and types of plugs.
  - 3. Number, size, material, location and method of installation of suction piping.
  - 4. Number, size, material, method of installation and location of installation of discharge piping.
  - 5. Bypass pump sizes, capacity, and number of each size to be on site and power requirements.

6. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted).
7. Standby power provisions.
8. Thrust and restraint block sizes and locations if applicable.
9. Any temporary pipe supports and anchoring required.
10. Design plans and access provisions to bypass pumping and generator fueling locations indicated on the Drawings.
11. Calculations for selection of bypass pumping pipe size.
12. Schedule for installation and maintenance of bypass pumping lines.
13. Continuous monitoring, operating and emergency response plan.

## PART 2 PRODUCTS

### 2.01 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Bypass pumping systems shall have sufficient capacity to pump the flows noted in Section 01 12 16 and the Drawings. The Contractor shall provide all pumps of adequate size to handle the flow events and temporary piping to ensure that the total flow can be safely diverted around the work area.
- B. Contractor shall have adequate standby equipment available onsite and ready for immediate operation and use in the event of an emergency or breakdown.
- C. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
- D. The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances.
- E. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.
- F. The Contractor shall protect water resources wetlands and other natural resources.
- G. The Contractor shall provide standby power to all electric pumping units in the event of power loss.



## 2.02 EQUIPMENT

- A. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to handle low flow events for long periods of time to accommodate the cyclical nature of wastewater flows.
- B. The Contractor shall provide the necessary stop/start and variable speed controls for each pump. The motor controls shall use a PLC based level control system with a submersible level transducer to initiate start and stop signals to the motor controls.
- C. Discharge piping systems shall be constructed of restrained joint type piping. Joints shall allow no leakage. Standard aluminum irrigation piping is not acceptable.

## PART 3 EXECUTION

### 3.01 FIELD QUALITY CONTROL AND MAINTENANCE

- A. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping prior to actual operation.
- B. The Contractor shall inspect the bypass pumping system every two hours to ensure that the system is working correctly.
- C. The Contractor shall ensure that the temporary pumping system is properly maintained and that a responsible operator shall be on hand at all times when pumps are operating.
- D. The Contractor shall submit a plan for the replacement of malfunctioning equipment.
- E. Spare parts for pumps and piping shall be kept on site as required.
- F. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

### 3.02 INSTALLATION AND OPERATION

- A. The Contractor shall install the bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Owner and the Engineer. Routing of bypass pipelines shall not impede traffic flow.
- B. The Contractor shall protect the temporary pumping station and piping from damage during construction.
- C. Contractor shall provide all fuel and power for the temporary pumping facility. Contractor shall make arrangements for a power meter and pay all associated fees should power electrical power be required.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE

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

### 1.02 PROTECTION OF ADJACENT PROPERTY

- A. The Bidders shall visit the site and note the buildings, landscaping, roads, parking areas and other facilities near the work site that may be damaged by their operations. The Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from Contractor's operations.
- B. Protect all existing facilities (indoors or out) from damage by dust, fumes, spray or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation and building or other surfaces from dirt, dust, welding fumes, paint spray, spills or droppings causing wear, corrosion, malfunction, failure or defacement by enclosure, sprinkling or other dust palliatives, masking and covering, exhausting or containment.

END OF SECTION

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## PART 1 GENERAL

### 1.01 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.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE

- A. The work specified in this Section consists of providing and maintaining temporary and permanent erosion and sedimentation controls as shown on the Drawings. This Section also specifies the subsequent removal of temporary erosion and sedimentation controls.
- B. Temporary and permanent erosion and sedimentation controls include grassing and mulching of disturbed areas and structural barriers at those locations which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by the Tennessee Water Quality Control Act of 1977, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations and laws of local and municipal authorities having jurisdiction. For installation and maintenance guidance, refer to the Tennessee Erosion and Sediment Control Handbook, latest edition.
- C. Land disturbance activity shall not commence until the Land Disturbance Permit and all required stream crossing permits have been issued.
- D. Land disturbance permit shall be obtained and paid for by the Contractor.

### 1.02 SUBMITTALS

- A. Submit product data in accordance with the requirements of Section 01 33 23 of these Specifications.
- B. Prior to any construction activity, the Contractor shall submit, for the Engineer's approval, a schedule for the accomplishment of temporary and permanent erosion and sedimentation control work. No work shall be started until the erosion and sedimentation control schedule and methods of operation have been approved by the Engineer.

### 1.03 QUALITY ASSURANCE

- A. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at no additional cost to the Owner.
- B. Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

- C. Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Tennessee Water Quality Control Act of 1977, as amended, local ordinances, other permits, local enforcing agency guidelines and these Specifications.
- D. Basic Principles
1. Coordinate the land disturbance activities to fit the topography, soil types and conditions.
  2. Minimize the disturbed area and the duration of exposure to erosive elements.
  3. Provide temporary or permanent stabilization to disturbed areas immediately after rough grading is complete.
  4. Safely convey run-off from the site to a stable outlet to prevent flooding and damage to downstream facilities resulting from increased runoff from the site.
  5. Retain sediment on-site that was generated on-site.
  6. Minimize encroachment upon watercourses.
- E. Implementation
1. The Contractor is solely responsible for the control of erosion within the Project site and the prevention of sedimentation from leaving the Project site or entering waterways.
  2. The Contractor shall install temporary and permanent erosion and sedimentation controls which will ensure that runoff from the disturbed area of the Project site shall pass through a filter system before exiting the Project site.
  3. The Contractor shall provide temporary and permanent erosion and sedimentation control measures to prevent silt and sediment from entering the waterways. The Contractor will obtain a Land Disturbance Permit that allows encroachments on the 60-foot vegetative buffer in specific areas. The Contractor shall exercise extreme care during land disturbance operations within the 60-foot vegetative buffer to prevent degradation of the stream.
  4. The Contractor shall limit land disturbance activity to those areas shown on the Drawings.
  5. The Contractor shall maintain erosion and sedimentation control measures within disturbed areas on the entire site at no additional cost to the Owner until the acceptance of the Project. Maintenance shall include mulching, re-seeding, clean-out of sediment barriers and sediment ponds, replacement of washed-out or undermined rip rap and erosion control materials, to the satisfaction of the Engineer.



6. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.
7. The Contractor shall use all means necessary to control dust on and near the work and all off-site borrow areas, in accordance to the Tennessee Erosion and Sediment Control Handbook, latest edition. The Contractor should thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of work on the site.

## PART 2 PRODUCTS

### 2.01 SEDIMENT BARRIERS

#### A. Silt Fence

1. Type A silt fence shall meet the requirements of Tennessee Erosion and Sediment Control Handbook, latest edition. Posts shall be 4 feet in length and can either be made of steel, soft wood or oak. Steel posts shall be 1.3lb./ft. minimum. Soft wood post shall be 3" diameter or 2" x 4". Oak posts shall be 1.5" x 1.5". Fasteners for wood posts shall be wire staples or nails. Wire staples are to have a minimum 17 gauge, 3/4" crown width, and a 1/2" leg length. Nails are to have a minimum 14 gauge, 3/4" button head, and a 1" length.
2. Type C silt fence is a combination of Type A silt fence fabric with woven wire reinforcement. Type C silt fence woven wire reinforcement shall meet the requirements of Tennessee Erosion and Sediment Control Handbook, latest edition. Posts shall be 4 feet in length and shall be made of steel. Steel posts shall be 1.3lb./ft. minimum.
3. Silt fence fabric shall meet the requirements of the Tennessee Erosion and Sediment Control Handbook, latest edition.

### 2.02 STORM DRAIN INLET PROTECTION

- A. Silt Fence Inlet Protection: Type C Silt fence supported by steel posts shall be used. See Silt Fence this Part.
- B. Baffle Box Inlet Protection:
  1. Shall be constructed of 2" x 4" boards spaced a maximum of 1 inch apart or of plywood with weep holes 2 inches in diameter.
  2. Gravel: 1/2 to 3/4 inch gravel (#57 washed stone).
  3. Type C filter fabric wrapping: See Silt Fence this Part.
- C. Block and Gravel Inlet Protection
  1. Concrete Masonry Block.

2. Gravel: 1/2 to 3/4 inch gravel (#57 washed stone).
  3. Hardware cloth or comparable wire mesh with 1/2 inch openings.
- D. Gravel Drop Protection
1. Gravel: 1/2 to 3/4 inch gravel (#57 washed stone).
- E. Sod Inlet Protection
1. 1' wide strips of sod. See Tennessee Erosion and Sediment Control Handbook, Section 7.10 – Sod for correct placement and planting schedules.

## 2.03 CHECK DAMS

### A. Stone Check Dams

1. Stone check dams shall be constructed of graded size 2-10 inch stone.
2. The geotextile shall be in accordance with AASHTO M288 Section 7.3, Separation Requirements, Table 3.

### B. Rock Check Dams

1. Stone sizing: The stone size shall be determined by the design criteria established in the Rip Rap section - Tennessee Erosion and Sediment Control Handbook, latest edition. The rock dam can be faced with smaller stone on the upstream side for additional filtering effect.
2. Geotextile: Geotextiles shall be used as a separator between the graded stone, the soil base, and the abutments. The geotextile shall be specified in accordance with AASHTO M288 Section 7.5, Permanent Erosion Control Recommendations.

## 2.04 CONSTRUCTION EXIT

- A. Stone: Use sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Aggregate size shall be TDOT #1 or #2 stone (1.5 to 3.5-inch stone).
- B. Geotextile: The geotextile underliner must be placed the full length and width of the entrance. Geotextile selection shall be based on AASHTO M288-98 specification:
1. For subgrades with a CBR greater than or equal to 3 or shear strength greater than 90 kPa, geotextile must meet requirements of section AASHTO M288 Section 7.3, Separation Requirements.
  2. For subgrades with a CBR between 1 and 3 or sheer strength between 30 and 90 kPa, geotextile must meet requirements of AASHTO M288 Section 7.4, Stabilization Requirements.

## 2.05 RIP RAP

- A. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Sizes are shown in the Drawings for each design requiring rip rap construction. The following classifications shall be used in the construction of slope or channels as shown on the Drawings:
1. Graded Rip Rap - durable, dense, specifically selected and graded, quarried stone, placed to prevent erosion. Sizes shall be in accordance to the Tennessee Erosion and Sediment Control Handbook, latest edition.
  2. Filter Bedding Stone - stone generally less than 6 inches in size, that may be placed under graded rip rap stone in a layer or combination of layers, designed and installed in such a manner as to prevent loss of underlying soil or finer materials because of moving water. Sizes shall be in accordance to the Tennessee Erosion and Sediment Control Handbook, latest edition.
  3. Surge Stone - a quarry run ungraded, unscreened material which may or may not have fines.

## 2.06 GABIONS

- A. Gabions shall be large, multi-celled, rectangular wire mesh boxes filled with 4 to 8-inch size pieces of stone to prevent erosion, scour or sloughing of an embankment. Gabions shall have the following features:
1. Hexagonal mesh pattern, which under stress will deform but not break.
  2. Triple twist, which will make the mesh non-raveling.
  3. Reinforcing wires woven into each corner, which will increase the strength at the stress points and help the gabion retain its shape during and after filling.
  4. A diaphragm securely attached to the base, which will prevent the shifting of the stone and at the same time, reinforce the gabion.
- B. The wire mesh shall have an opening of approximately 3 x 4-inches and shall be a minimum 12 gauge. Wire mesh shall be galvanized.
- C. Gabion baskets shall be 12 feet long x 3 feet high with four cells.
- D. Geotextile: Geotextiles shall be used behind all gabion structures. Geotextiles shall be in accordance with AASHTO M288 Section 7.5, Permanent Erosion Control Requirements.

## 2.07 POLYACRYLAMIDE (PAM)

- A. Polyacrylamide (PAM) additives are permissible as a supplement to existing Best Management Practices and are not to be relied on as the only method for erosion control.

- B. If the Contractor intends to use PAM additives, they shall provide adequate documentation and testing to show the polymer type and dosing has been matched to the soil type found in the work area. Testing and documentation shall be prepared by the manufacturer of the polymer or other licensed soil professional.
- C. PAM products include, but are not limited to, additives to the soil, hydro-seeder, treated mat, treated checks dams, bars or logs. Due to the different nature of products, manufacturer's directions shall be provided to the Engineer prior to their use. Toxicology reports shall be supplied with all submittal data prior to use.
- D. PAM products shall conform to the following guidelines:
1. Only the anionic form of PAM shall be used. Cationic PAM is toxic and shall NOT be used.
  2. PAM and PAM mixtures shall be environmentally benign, harmless to fish, wildlife, and plants. PAM and PAM mixtures shall be noncombustible.
  3. Anionic PAM, in pure form, shall have less than or equal to 0.05% acrylamide monomer by weight, as established by the Food and Drug Administration and the Environmental Protection Agency.
  4. To maintain less than or equal to 0.05% of acrylamide monomer, the maximum application rate of PAM, in pure form, shall not exceed 200 pounds/acre/year. Do not over apply PAM. Excessive application of PAM can lower infiltration rate or suspend solids in water, rather than promoting settling.
  5. Users of anionic PAM shall obtain and follow all Material Safety Data Sheet requirements and manufacturer's recommendations.
  6. Additives such as fertilizers, solubility promoters or inhibitors, etc. to PAM shall be non-toxic.
  7. The manufacturer or supplier shall provide written application methods for PAM and PAM mixtures. The application method shall insure uniform coverage to the target and avoid drift to non-target areas including waters of the state. The manufacturer or supplier shall also provide written instructions to insure proper safety, storage, and mixing of the product.
  8. Gel bars or logs of anionic PAM mixtures may be used in ditch systems. This application shall meet the same testing requirement as anionic PAM emulsions and powders.
  9. To prevent exceeding the acrylamide monomer limit in the event of a spill, the anionic PAM in pure form shall not exceed 200 pounds/batch at 0.05% acrylamide monomer (AMD) or 400 pounds/batch at 0.025% AMD.

## 2.08 EROSION CONTROL MATTING AND BLANKETS

- A. All blanket and matting materials shall be in accordance to the Tennessee Erosion and Sediment Control Handbook, latest edition.
- B. Temporary Erosion Control Blankets: Use in concentrated flow areas, all slopes steeper than 3:1 and with a height of ten feet or greater, and cuts and fills within stream buffers, shall be stabilized with the appropriate erosion control matting or blankets.
1. Straw blankets: Shall consist of weed-free straw from agricultural crops formed into a blanket. Blankets shall have a top side of photodegradable plastic mesh with a maximum mesh size of 5/16 x 5/16 inch sewn to the straw with biodegradable thread that is appropriate for slopes. The blanket shall have a minimum thickness of 3/8 inch and minimum dry weight of 0.5 pounds per square yard.
  2. Excelsior blankets: Shall consist of curled wood excelsior (80% of fibers are six inches or longer) formed into a blanket. The blanket shall have clear markings indicating the top side of the blanket and be smolder resistant. Blankets shall have photodegradable plastic mesh having a maximum mesh size of 1- 1/2 1/2 x 3 inches. The blanket shall have a minimum thickness of 1/4 of an inch and a minimum dry weight of 0.8 pounds per square yard. Slopes require excelsior matting with the top side of the blanket covered in the plastic mesh, and for waterways, both sides of the blanket require plastic mesh.
  3. Coconut fiber blankets: Shall consist of 100% coconut fiber formed into a blanket. The minimum thickness of the blanket shall be 1/4 of an inch with a minimum dry weight of 0.5 pounds per square yard. Blankets shall have photodegradable plastic mesh, with a maximum mesh size of 5/8 x 5/8 inch and sewn to the fiber with a breakdown resistant synthetic yarn. Plastic mesh is required on both sides of the blanket if used in waterways. A maximum of two inches is allowable for the stitch pattern and row spacing.
  4. Wood fiber blankets: Shall consist of reprocessed wood fibers that does not possess or contain any growth or germination inhibiting factors. The blanket shall have a photodegradable plastic mesh, with a maximum mesh size of 5/8 x 3/4 inch, securely bonded to the top of the mat. The blanket shall have a minimum dry weight of 0.35 pounds per square yard. A maximum of two inches is allowable for the stitch pattern and row spacing. This practice shall be applied only to slopes.
  5. Jute Mesh: To be applied to slopes. Jute mesh with a 48-inch width shall show between 76 and 80 warpings and a one yard length shall show between 39 to 43 weftings. The woven mesh shall be at least 45 inches wide. Yarn shall have a unit weight of at least 0.9 pounds per square yard, but not more than 1.5 pounds per square yard.

C. Permanent Matting: Use in concentrated flow areas, all slopes steeper than 3:1 and with a height of ten feet or greater, and cuts and fills within stream buffers, shall be stabilized with the appropriate erosion control matting or blankets.

1. Permanent matting shall consist of a lofty web of mechanically or melt bonded polymer nettings, monofilaments or fibers which are entangled to form a strong and dimensionally stable matrix. Polymer welding, thermal or polymer fusion, or the placement of fibers between two high strength, bi-axially oriented nets bound securely together by parallel lock stitching with polyolefin, nylon or polyester threads are all appropriate bonding methods. Mats shall maintain their shape before, during, and after installation, under dry or water saturated conditions. Mats must be stabilized against ultraviolet degradation and shall be inert to chemicals normally encountered in a natural soil environment.
2. The mat shall conform to the following physical properties:

<u>Property</u>	<u>Minimum Value</u>
Thickness	0.5 inch
Weight	0.6 PSY
Roll Width	38 inches
Tensile Strength	
Length (50% elongation)	15 lbs./in.
Length (ultimate)	20 lbs./in.
Width (50% elongation)	5 lbs./in.
Width (ultimate)	10 lbs./in.
	(ASTM D 1682-6" strip)
Ultraviolet Stability	80%
	(1,000 hrs. in an Atlas ARC Weatherometer, ASTM G 23, Type D in accordance with ASTM D 822)

D. Stapling and Anchoring Materials:

1. Temporary Blankets: Staples shall be used to anchor temporary blankets. U-shaped wire (11 gauge or greater) staples with legs at least 6 inches in length and a crown of one inch or appropriate biodegradable staples can be used. Staples shall be of sufficient thickness for soil penetration without undue distortion.
2. Permanent Matting: Sound wood stakes, 1 x 3 inches stock sawn in a triangular shape, shall be used. Depending on the compaction of the soil, select stakes with a length from 12 to 18 inches. U-shaped staples shall be 11 gauge steel or greater, with legs at a minimum of 8 inches length with a 2 inch crown.

## 2.09 CHANNEL STABILIZATION

- A. Vegetated Lining: Vegetated lining shall be designed to resist erosion when the channel is flowing at the 25-year frequency discharge. Temporary erosion control blankets or sod shall be used on all channels and concentrated flow areas to aid in the establishment of the vegetated lining. If a vegetated lining is desired in a channel with velocities between 5- 10 ft./sec., permanent soil reinforcement matting shall be used.
- B. Rock Rip- Rap Lining: Rock rip rap shall be designed to resist displacement when the channel is flowing at the 25-year frequency discharge. Rock rip rap lining should be used when channel velocities are between 5 and 10 ft./sec.
- C. Concrete Lining
  - 1. Concrete shall be constructed in accordance with the plan and details in the Drawings.
  - 2. A separation geotextile should be placed under concrete linings to prevent undermining in the event of stress cracks due to settlement of the base material. Geotextiles shall be in accordance with AASHTO M288 Section 7.5, Permanent Erosion Control Requirements.

## 2.10 DOWNDRAIN STRUCTURES

- A. Temporary Downdrain:
  - 1. Pipe: Design the slope drain using heavy-duty, flexible materials such as non-perforated, corrugated plastic pipe or specially designed flexible tubing. Use reinforced, hold-down grommets or stakes to anchor the pipe at intervals not to exceed 10 feet with the outlet end securely fastened in place. The pipe must extend beyond the toe of the slope.
  - 2. Filter Ring: A stone filter ring shall be placed at the inlet for added sediment filtering capacity.
  - 3. Storm Drain Outlet Protection: Rock rip rap shall be placed at the outlet for energy dissipation. A Tee outlet, flared end section, or other suitable device may be used in conjunction with the rip rap for additional protection.
- B. Permanent Downdrain:
  - 1. Pipe: Design the slope drain using heavy-duty, flexible materials such as non-perforated, corrugated plastic or steel pipe or specially designed flexible tubing. Use reinforced, hold-down grommets or stakes to anchor the pipe at intervals not to exceed 10 feet with the outlet end securely fastened in place. The pipe must extend beyond the toe of the slope.

2. Paved Flume: The paved flume may have a parabolic, rectangular or trapezoidal cross-section and shall consist of reinforced concrete or asphalt paving.
3. Filter Ring: A stone filter ring shall be placed at the inlet for added sediment filtering capacity.
4. Storm Drain Outlet Protection: Rock rip rap shall be placed at the outlet for energy dissipation. A Tee outlet, flared end section, or other suitable device may be used in conjunction with the rip rap for additional protection.

## 2.11 FILTER RING

### A. Stone sizing:

1. When utilized at inlets with diameters less than 12 inches, the filter ring shall be constructed of TDOT Class A-3 stone no smaller than 2-6 inches (15 - 30 lbs.).
2. When utilized at pipes with diameters greater than 12 inches, the filter ring shall be constructed of TDOT Class A-1 stone no smaller than 2-15 inches (50 - 100 lbs.).
3. For added sediment filtering capabilities the upstream side of the rip- rap can be faced with TDOT #57 stone, minimum stone size of  $\frac{3}{4}$  inch.

## 2.12 TEMPORARY SEDIMENT BASIN

- ### A. Temporary Sediment Basins shall be constructed in accordance with the plan and details shown in the Drawings.

## 2.13 TEMPORARY STREAM CROSSING

- ### A. Temporary Stream Crossing shall be constructed in accordance with the plan and details shown in the Drawings. Temporary crossings shall not be used on streams with drainage areas greater than one square mile and shall be a constructed as a culvert crossing, as shown in the Drawings.

## 2.14 STORM DRAIN OUTLET PROTECTION

- ### A. Stone size: Stone size as indicated for each outlet in the Storm Drain Outlet Protection detail shown in the Drawings.
- ### B. Geotextile: Geotextiles shall be used as a separator between the graded stone, the soil base, and the abutments. The geotextile shall be specified in accordance with AASHTO M288-96 Section 7.5, Permanent Erosion Control Recommendations.
- ### C. Stone quality: Select stone for rip rap from field stone or quarry stone. The stone should be hard, angular, and highly weather-resistant. The specific gravity of the individual stones should be at least 2.5.



## 2.15 GRADIENT TREATMENT

- A. Contour Furrow: Contour furrows may be used for slopes which are 3:1 (H:V) or less.
- B. Serrated Slope: A serrated slope may be used for slopes which are 2:1 (H:V) or less.
- C. Stepped Slope: Graded areas steeper than 3:1 (H:V), which will not be mowed, should preferably have a stepped slope.
- D. Terraced Slope: Should be used on most slopes which are longer than those allowed for other methods.

## 2.16 TEMPORARY MULCHING

- A. Dry straw or hay: Shall be applied at a depth of 2 to 4 inches providing complete soil coverage. Material shall be clean, seed-free cereal hay or straw.
- B. Wood waste (chips, sawdust or bark): Shall be applied at a depth of 2 to 3 inches. Organic material from the clearing stage of development should remain on site, be chipped, and applied as mulch.
- C. Mulch Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Engineer. The mulch binder shall be non toxic to plant and animal life and shall be approved by the Engineer.

## 2.17 TEMPORARY GRASSING

- A. Grassing materials shall meet the requirements of the Tennessee Erosion and Sediment Control Handbook, latest edition, section that includes "Disturbed Area Stabilization (With Temporary Vegetation)".
- B. Seed rate, fertilization, lime application and other requirements shall be provided as shown on the Drawings.
- C. Water: Water shall be free of excess and harmful chemicals, organisms and substances which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used. Water shall be furnished by the Contractor.

## 2.18 PERMANENT GRASSING AND SODDING

- A. As specified elsewhere in these Specifications.

## 2.19 TURBIDITY CURTAIN

- A. Barriers shall be a bright color (yellow or "international" orange are recommended) that will attract the attention of nearby boaters.
- B. The curtain fabric shall meet the following minimum requirements:

PHYSICAL PROPERTY	REQUIREMENT
THICKNESS, MILS	45
WEIGHT/OZ.SQ.YD:	
TYPE I	18
TYPE II	18 OR 22
TYPE III	22
GRAB TENSILE STRENGTH, LBS.	300
UV INHIBITOR	MUST BE INCLUDED

- C. Seams in the fabric shall be vulcanized, welded, or sewn, and shall develop the full strength of the fabric.
- D. Flotation devices shall be flexible, buoyant units, contained in an individual flotation sleeve or collar attached to the curtain. Buoyancy provided by the flotation units shall be sufficient to support the weight of the curtain and maintain a freeboard of at least 3 inches above the water surface.
- E. Load lines shall be fabricated into the bottom of all floating turbidity curtains. When installing in moving waters, load lines shall also be fabricated into the top of the fabric. The top load line shall consist of woven webbing or vinyl-sheathed steel cable, and shall have a break strength in excess of 10,000 pounds. The supplemental (bottom) load line shall consist of a chain incorporated into the bottom hem of the curtain, with sufficient weight to serve as ballast to hold the curtain in a vertical position. Additional anchorage shall be provided as necessary. The load lines shall have suitable connecting devices which develop the full breaking strength for connecting to load lines in adjacent sections for calm water installation.
- F. External anchors may consist of wooden or metal stakes (2- x 4-inch or 2.5-inch minimum diameter wood, or 1.33 pounds/linear foot steel) when installing in calm waters; when installing in moving waters, bottom anchors must be used.
- G. Bottom anchors shall be sufficient to hold the curtain in the same position relative to the bottom of the watercourse, without interfering with the action of the curtain. The anchor may dig into the bottom (grappling hook, plow or fluke-type), or may be weighted (mushroom type), and shall be attached to a floating anchor buoy via an anchor line. The anchor line shall run from the buoy to the top load line of the curtain. When installing in moving waters, these lines shall contain enough slack to allow the buoy and curtain to float freely with tidal changes without pulling the buoy or curtain down, and shall be checked regularly to make sure they do not become entangled with debris. As previously noted, anchor spacing will vary with current velocity and potential wind and wave action; manufacturer's recommendations should be followed.

## 2.20 SEDIMENT TRAPS

- A. The area under the embankment should be cleared, grubbed, and stripped of any vegetation and root mat.

- B. Fill material for the embankment should be free of roots or other woody vegetation, organic material, large stones, and other objectionable material.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Temporary and permanent erosion and sedimentation control measures shall prevent erosion and prevent sediment from exiting the site. If, in the opinion of the Engineer, the Contractor's temporary erosion and sedimentation control measures are inadequate, the Contractor shall provide additional maintenance for existing measures or additional devices to control erosion and sedimentation on the site at no additional cost to the Owner.
- B. All erosion and sedimentation control devices and structures shall be inspected by Contractor or Personnel qualified in stormwater best management practices implementation at least once a week and within 24 hours of the end of a storm that is 0.5 inches or greater. Any device or structure found to be damaged will be repaired or replaced by the end of the day.
- C. All erosion and sedimentation control measures and devices shall be constructed and maintained as indicated on the Drawings or specified herein until adequate permanent disturbed area stabilization has been provided and accepted by the Engineer. Once adequate permanent stabilization has been provided and accepted by the Engineer, all temporary erosion and sedimentation control structures and devices shall be removed.

### 3.02 INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROLS

- A. Sediment Barriers
  - 1. Sediment barriers shall include, but are not necessarily limited to silt fences and any device which prevents sediment from exiting the disturbed area.
  - 2. Sediment barriers shall not be used in any flowing stream, creek or river.
  - 3. Sediment barriers shall be installed as shown on the Drawings and as directed by the Engineer.
  - 4. Along stream buffers and other sensitive areas, two rows of Type C silt fence or one row of Type C silt fence backed by hay bales shall be used.
  - 5. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one-half of the original height of the barrier or as directed by the Engineer. Torn, damaged, destroyed or washed-out barriers shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Engineer.

6. Sediment Barrier Removal
  - a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Engineer.
  - b. Accumulated sediment shall be removed from the barrier and spread over the site.
  - c. All non-biodegradable parts of the barrier shall be disposed of properly.
  - d. The disturbed area created by barrier removal shall be permanently stabilized.

B. Storm Drain Inlet Protection

1. Inlet Sediment Traps shall include, but are not necessarily limited to, Silt Fence Inlet Protection, Baffle Box, Block and Gravel Inlet Protection, Gravel Inlet Protection, Sod Inlet Protection and any device which traps sediment and prevents it from exiting the disturbed area.
2. Inlet Sediment Traps shall be installed as shown on the Drawings and as directed by the Engineer.
3. For each Inlet Sediment Traps type the following installation guidelines shall be used:
  - a. Silt Fence Inlet Protection: Type C silt fence supported by steel posts shall be used. The stakes shall be spaced evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely driven into the ground, approximately 18 inches deep. The fabric shall be entrenched 12 inches and backfilled with crushed stone or compacted soil. Fabric and wire shall be securely fastened to the posts, and fabric ends must be overlapped a minimum of 18 inches or wrapped together around a post to provide a continuous fabric barrier around the inlet.
  - b. Baffle Box: The baffle box shall be constructed of 2" x 4" boards spaced a maximum of 1 inch apart or of plywood with weep holes 2 inches in diameter. The weep holes shall be placed approximately 6 inches on center vertically and horizontally. Gravel shall be placed outside the box, all around the inlet, to a depth of 2 to 4 inches. The entire box is wrapped in Type C filter fabric that shall be entrenched 12 inches and backfilled.
  - c. Block and Gravel Inlet Protection: One block is placed on each side of the structure on its side in the bottom row to allow pool drainage. The foundation should be excavated at least 2 inches below the crest of the storm drain. The bottom row of blocks are is placed against the edge of the storm drain for lateral support and to avoid washouts when overflow occurs. If needed, lateral support may be given to subsequent rows by placing 2" x 4" wood studs through block openings. Hardware cloth or comparable wire mesh with 1/2 inch openings shall be fitted over all block openings to hold gravel in place. Clean gravel should be placed 2 inches below the top of the block on a 2:1 slope or flatter and smoothed to an even grade.
  - d. Gravel Inlet Protection: Stone and gravel are used to trap sediment. The slope toward the inlet shall be no steeper than 3:1. A minimum 1 foot wide level stone area shall be left between the structure and around the

inlet to prevent gravel from entering the inlet. On the slope toward the inlet, stone 3 inches in diameter and larger should be used. On the slope away from the inlet, 1/2 to 3/4 inch gravel (#57 washed stone) should be used at a minimum thickness of 1 foot.

- e. Sod Inlet Protection: The sod shall be placed to form a turf mat covering the soil for a distance of 4 feet from each side of the inlet structure. Sod strips shall be staggered so that adjacent strip ends are not aligned.
4. The trap shall be inspected daily and after each rain and repairs made as needed. Sediment shall be removed when the sediment has accumulated to one-half the height of the trap. Sediment shall be removed from curb inlet protection immediately. For excavated inlet sediment traps, sediment shall be removed when one-half of the sediment storage capacity has been lost to sediment accumulation. Sod inlet protection shall be maintained as specified for Permanent Sodding.
  5. Sediment Barrier Removal
    - a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Engineer.
    - b. Accumulated sediment shall be removed from the barrier and removed from the site.
    - c. All non-biodegradable parts of the barrier shall be disposed of properly.
    - d. The disturbed area created by barrier removal shall be permanently stabilized.
- C. Check and Rock Dams
1. Check and rock dams shall not be used in any flowing stream, creek or river.
  2. Check and rock dams shall be installed as shown on the Drawings and as directed by the Engineer.
  3. Stone check dams: Mechanical or hand placement shall be required to insure complete coverage of entire width of ditch or swale and that center of dam is lower than edges.
  4. Rock dams: Mechanical or hand placement will be required to insure that the rock dam extends completely across the channel and securely ties into both channel banks. The center of the dam must be no less than six inches lower than the lowest side, to serve as a type of weir. Gabions can be installed to serve as rock filter dams, but should follow recommended sizing and installation specifications. Refer to Gabions in this specification.
  5. Height: The center of the check dam must be at least 9 inches lower than outer edges. Dam height should be 2 feet maximum measured to center of check dam.
  6. Side Slopes: Side slopes shall be 2:1 or flatter.

7. Spacing: Two or more check dams in series shall be used for drainage areas greater than one acre. Maximum spacing between dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
8. A geotextile should be used as a separator between the graded stone and the soil base and abutments. The geotextile shall be placed immediately adjacent to the subgrade without any voids and extend five feet beyond the downstream toe of the dam to prevent scour.
9. Check and rock dams shall be maintained to ensure the depth of impounded sediment is no more than one-half of the original height of the check dam or as directed by the Engineer. Damaged, destroyed or washed-out check dams shall be repaired, reinforced or replaced with new material and installed as shown on the Drawings and as directed by the Engineer.
10. Check and Rock Dams removal
  - a. Check and rock dams shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required as directed by the Engineer.
  - b. Accumulated sediment shall be removed from the check and rock dams when it reaches a depth of one-half of the original height of the dam and removed from the site.
  - c. All non-biodegradable parts of the barrier shall be disposed of properly.
  - d. The disturbed area created by check or rock dam removal shall be permanently stabilized.

#### D. Construction Exit

1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Engineer. A construction exit shall be located at any point traffic will be leaving a disturbed area to a public right-of-way, street, alley, sidewalk or parking area.
2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The geotextile underliner shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.
3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights-of-way and paved surfaces as directed by the Engineer. This shall require periodic top dressing with 1.5-3.5 inch stone, as conditions demand.
4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of when the disturbed area has been properly stabilized, the tracking

or flow of soil onto public rights-of-way or paved surfaces has ceased and as directed by the Engineer.

E. Rip Rap

1. Rip rap shall be placed as shown on the Drawings and as directed by the Engineer. Rip rap shall be placed at all points where natural vegetation is disturbed on the banks of streams or drainage ditches. Compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction along side a stream or drainage ditch as well as crossing a stream or drainage ditch.
2. When trenching across a stream or drainage ditch, place rip rap over the entire disturbed area upstream and downstream of the trench excavation. Place rip rap across creek bottom, across creek banks and extend rip rap placement five feet beyond the top of each creek bank.
3. Preparation of Foundations: The ground surface upon which the rip rap is to be placed shall be brought to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers. Unless at creek banks or otherwise shown or specified, rip rap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet deep in original ground, and the side next to the fill or cut shall have that same slope. After the rip rap is placed, the toe ditch shall be backfilled and the excess dirt spread neatly within the construction easement or on the site.
4. Placement of Plastic Filter Fabric
  - a. Plastic filter fabric shall be placed under all rip rap unless shown or specified otherwise.
  - b. Filter fabric shall not be placed under rip rap on stream or drainage ditch crossings.
  - c. The surface to receive filter fabric shall be prepared to a smooth condition free from obstructions, depressions and debris. The filter fabric shall be installed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The fabric shall be placed to provide a minimum width of one foot of overlap at each joint. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed loosely to avoid stretching and tearing during placement of the stone. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals or other contaminants. Contaminated fabric or fabric damaged during installation or during placement of rip rap shall be removed and replaced with uncontaminated and undamaged fabric at no additional cost to the Owner.
5. Placement of Rip Rap: Rip rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. Rip rap shall be placed with

its top elevation conforming with the finished grade or the natural existing slope of the stream bank and stream bottom. The stone shall be dropped no more than three feet during construction.

- a. Stone Rip Rap: Stone rip rap shall be placed to provide a uniform surface to the thickness shown on the Drawings. The thickness tolerance for the course shall be -3-inches and +6-inches.

#### F. Gabions

1. Where, in the opinion of the Engineer, the slope of the banks of the stream is too steep to support rip rap, gabions shall be provided, in lieu of rip rap.
2. Gabions shall be assembled according to the manufacturer's recommendations. Laterally adjoining gabions shall be wired together by vertical edges. Vertically adjoining gabions shall be wired together along the front and back edges. Rip rap size for gabion construction shall be large enough not to fall out of gabions, but small enough to form three layers. Gabions shall be placed over a 6-inch layer of soil, crushed stone or sand overlaying a filter fabric.

#### G. Polyacrylamide (PAM)

1. Application rates shall conform to manufacturer's guidelines for application.
2. Maintenance will consist of reapplying anionic PAM to disturbed areas including high use traffic areas which interfere in the performance of this practice.

#### H. Erosion Control Matting and Blankets

1. Erosion Control Matting and Blankets be placed as shown on the Drawings and as directed by the Engineer.
2. After the site has been shaped and graded to the approved design, prepare a friable seedbed relatively free from clods and rocks more than one inch in diameter, and any foreign material that will prevent contact of the soil stabilization mat with the soil surface. Surface must be smooth to ensure proper contact of blankets or matting to the soil surface. If necessary, redirect any runoff from the ditch or slope during installation.
3. Follow manufacturer's recommendations and follow details as shown on the Drawings for laying and stapling.
4. All erosion control blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope or ditch. Continue to monitor these areas until they become permanently stabilized.

#### I. Channel Stabilization



1. Where needed, all trees, brush, stumps and other objectionable materials shall be removed so they will not interfere with the construction or proper functioning of the channel.
2. Where possible, trees will be left standing, and stumps will not be removed.
3. Excavation shall be at the locations and grades shown on the Drawings. The lining shall not compromise the capacity of the channel, e.g. the emergency spillway shall be over-excavated so that the lining will be flush with the slope surface.
4. The geotextile shall be placed on a smooth graded surface. The geotextile shall be placed in such a manner that it will not excessively stretch or tear upon placement of the overlying materials. Care should be taken to place the geotextile in intimate contact with the soil such that no void spaces exist between the underlying soil and the geotextile.
5. Construction plans will specifically detail the location and handling of spoils. Spoil material resulting from clearing, grubbing and channel excavation shall be disposed of in a manner which will:
  - a. not cause an increase in flood stage,
  - b. minimize overbank wash,
  - c. not cause an adverse effect on the environmental integrity of the area,
  - d. provide for the free flow of water between the channel and flood plain unless the valley routing and water surface profile are based on continuous dikes being installed,
  - e. leave the right-of-way in the best condition feasible, and
  - f. improve the aesthetic appearance of the site to the extent feasible.
6. Channel linings shall be established or installed immediately after construction or as soon as weather conditions permit.
7. Structures shall be installed according to lines and grades shown on the plan. The foundation for structures shall be cleared of all undesirable materials prior to the installation of the structures.
8. Materials used in construction shall be of permanency commensurate with the design frequency and life expectancy of the facility.
9. Earthfill, when used as a part of the structures, shall be placed according to the installation requirements for sediment basin embankments.
10. Construction operations shall be carried out in such a manner that erosion and air and water pollution will be minimized. State and local laws concerning pollution abatement shall be complied with.
11. Vegetation shall be established on all disturbed areas immediately after construction. If weather conditions cause a delay in establishing vegetation, the area shall be mulched in accordance with the standard for mulching.

12. All temporary access roads or travelways shall be appropriately closed to exclude traffic.
13. Trees and other fallen natural vegetation not causing a deterrent to stream flow should be left for the purpose of habitat.

J. Downdrain Structures

1. Place slope drains on undisturbed soil or well compacted fill at locations and elevations shown on the Drawings.
2. Slightly slope the section of pipe under the dike toward its outlet.
3. Hand tamp the soil under and around the entrance section in lifts not to exceed 6 inches.
4. Ensure that fill over the drain at the top of the slope has minimum dimensions of 1.5 ft. depth, 4 ft. top width, and 3:1 side slopes.
5. Ensure that all slope drain connections are watertight.
6. Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet apart.
7. Place the drain slightly diagonally across the slope, extending the drain beyond the toe of the slope. Curve the outlet uphill and adequately protect the outlet from erosion.
8. If the drain is conveying sediment-laden runoff, direct all flows into a sediment trap or sediment basin.
9. Make the settled, compacted dike ridge no less than one foot above the top of the pipe at every point.
10. Immediately stabilize all disturbed areas following construction.
11. Install Storm Drain Outlet Protection as specified in this Part.
12. Maintenance: Inspect the slope drain and supporting diversion after every rainfall and promptly make necessary repairs. When the protected area has been permanently stabilized and the permanent stormwater disposal system is fully functional, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

K. Filter Ring

1. Filter Rings be placed as shown on the Drawings and as directed by the Engineer.

2. The filter ring shall be constructed at a height no less than two feet from grade.
3. Mechanical or hand placement of stone shall be required to uniformly surround the structure to be supplemented. Refer to Rip Rap, within this specification, for rock rip rap specifications.
4. When utilized below a storm drain outlet, it shall be placed such that it does not create a condition causing water to back-up into the storm drain and inhibit the function of the storm drain system.
5. Maintenance: The filter ring must be kept clear of trash and debris. This will require continuous monitoring and maintenance, which includes sediment removal when one-half full. Structures are temporary and should be removed when the land-disturbing project has been stabilized.

L. Temporary Sediment Basin

1. Site Preparation: Areas under the embankment and under structural works shall be cleared, grubbed, and stripped of topsoil. All trees, vegetation, roots and other objectionable material shall be removed and disposed of by approved methods. In order to facilitate clean-out or restoration, the pool area (measured at the top of the pipe spillway) will be cleared of all brush and trees.
2. Cut-off Trench: A cut-off trench will be excavated along the centerline of earth fill embankments. The minimum depth shall be 2 feet. The cut-off trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be 4 feet, but wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for the embankment. The trench shall be drained during the backfilling and compaction operations.
3. Embankment: The fill material shall be taken from approved areas shown on the Drawings. It shall be clean mineral soil free of roots, woody vegetation, oversized stones, rocks or other objectionable material. Relatively pervious materials such as sand or gravel (Unified Soil Classes GW, GP, SW & SP) shall be placed in the downstream section of the embankment. Areas on which fills are to be placed shall be scarified prior to placement of fill. The fill material shall contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of the ball, it is too wet for proper compaction. Fill material shall be placed in six-inch to eight-inch thick continuous layers over the entire length of the fill. Compaction shall be obtained by routing and hauling the construction equipment over the fill so that the entire surface of the fill is traversed by at least one wheel or tread track of the equipment or by the use of a compactor. The embankment shall be constructed to an elevation 5 percent higher than the design height to allow for settlement.
4. Principal Spillway: The riser shall be securely attached to the pipe or pipe stub by welding the full circumference making a watertight structural connection. The pipe stub must be attached to the riser at the same percent (angle) of

grade as the outlet conduit. The connection between the riser and the riser base shall be watertight. All connections between pipe sections must be achieved by approved watertight band assemblies. The pipe and riser shall be placed on a firm, smooth foundation of impervious soil as the embankment is constructed. Breaching the embankment is unacceptable. Pervious materials such as sand, gravel, or crushed stone shall not be used as backfill around the pipe or anti-seep collar. The fill material around the pipe spillway shall be placed in four inch layers and compacted under and around the pipe to at least the same density as the adjacent embankment. Care must be taken not to raise the pipe from firm contact with its foundation when compacting under the pipe haunches. A minimum depth of two feet of hand compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment.

5. **Emergency Spillway:** The emergency spillway shall be installed in undisturbed ground. The achievement of planned elevations, grades, design width, entrance and exit channel slopes are critical to the successful operation of the emergency spillway and must be constructed within a tolerance of  $\pm 0.2$  feet. If the emergency spillway requires erosion protection other than vegetation, the lining shall not compromise the capacity of the emergency spillway, e.g. the emergency spillway shall be over-excavated so that the lining will be flush with the slope surface.
6. **Vegetative Treatment:** Stabilize the embankment and all other disturbed areas in accordance with the appropriate permanent vegetative measure, see Specification 32 92 19 Loaming and Seeding, immediately following construction. In no case shall the embankment remain unstabilized for more than seven days.
7. **Erosion and Pollution Control:** Construction operations will be carried out in such a manner that erosion and water pollution will be minimized. State and local law concerning pollution abatement shall be complied with.
8. **Maintenance:** Repair all damages caused by soil erosion or construction equipment at or before the end of each working day. Sediment shall be removed from the basin when it reaches the specified distance below the top of the riser. Sediment shall not enter adjacent streams or drainage ways during sediment removal or disposal. The sediment shall not be deposited downstream from the embankment, adjacent to a stream or floodplain.
9. **Final Disposal:** When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposits are to be leveled or otherwise disposed of in accordance with approved sediment control plan. The proposed use of a sediment basin site will often dictate final disposition of the basin and any sediment contained therein. If the site is scheduled for future construction, then the embankment and trapped sediment must be removed, safely disposed of, and backfilled with a structural fill. When the basin area is to remain open space, the pond may be pumped dry, graded and backfilled.

#### M. Temporary Stream Crossing

1. All Crossings:
  - a. Clearing of the stream bed and banks shall be kept to a minimum.
  - b. All surface water from the construction site shall be diverted onto undisturbed areas adjoining the stream. Line unstable stream banks with rip rap or otherwise appropriately stabilize them.
  - c. The structure shall be removed as soon as it is no longer necessary for Project construction.
  - d. Upon removal of the structure, the stream shall immediately be restored to its original cross-section and properly stabilized.
  
2. Temporary Bridge Crossing:
  - a. The temporary bridge shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.
  - b. Abutments shall be placed parallel to and on stable banks.
  - c. Bridges shall be constructed to span the entire channel. If the channel width exceeds eight feet (as measured from the tops of the banks), a footing, pier or bridge support may be constructed within the waterway.
  - d. Bridges shall be securely anchored at only one end using steel cable or chain. Large trees, large boulders, or driven steel anchors can serve as anchors.
  
3. Temporary Culvert Crossing:
  - a. The invert elevation of the culvert shall be installed on the natural streambed grade.
  - b. The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.
  - c. The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by a minimum of 12 inches of compacted aggregate fill.
  
4. Maintenance: The structure shall be inspected after every rainfall and at least once a week, whether it has rained or not, and all damages repaired immediately. The structure shall be removed immediately after construction is finished, and the streambed and banks must be stabilized.

N. Storm Drain Outlet Protection

1. Ensure that the subgrade for the filter and rip rap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the rip rap thickness.
2. The rip rap and gravel filter must conform to the specified grading limits shown in the plans.
3. Geotextile must meet design requirements and be properly protected from punching or tearing during installation. Repair any damage by removing the rip rap and placing another piece of filter fabric over the damaged area. All

connecting joints should overlap a minimum of 1 foot. If the damage is extensive, replace the entire filter fabric.

4. Rip rap may be placed by equipment, but take care to avoid damaging the filter.
5. The minimum thickness of the rip rap should be 1.5 times the maximum stone diameter.
6. Construct the apron on zero grade with no overfall at the end. Make the top of the rip rap at the downstream end level with the receiving area or slightly below it.
7. Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.
8. Immediately after construction, stabilize all disturbed areas with vegetation.
9. Filter: Install a filter to prevent soil movement through the openings in the rip rap. The filter should consist of a graded gravel layer or a synthetic filter cloth.
10. Maintenance: Inspect rip rap outlet structures after heavy rains to see if any erosion around or below the rip rap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

#### O. Gradient Treatment

1. Contour Furrow: The maximum distance between furrows should be 40 feet, and the maximum slope length should be 200 feet. Refer to the Tennessee Erosion and Sediment Control Handbook, latest edition for detailed example of a contour furrow.
2. Serrated Slope: Bladed equipment will be needed to make numerous passes along a slope, beginning at the top and working downward. The maximum slope length should be 100 feet. Refer to the Tennessee Erosion and Sediment Control Handbook, latest edition for detailed example of a serrated slope.
3. Stepped Slope: Construct stepped slope as shown in the detailed example in the Tennessee Erosion and Sediment Control Handbook, latest edition. Steps should be wide enough to work with standard earth moving equipment. Preferably the horizontal distance should be at least 1.5 times the vertical cut distance. Slightly grade the horizontal bench inwards (e.g. back towards the top of slope). Do not make individual vertical cuts more than 24 inches high in soft materials or more than 36 inches high in rocky materials.
4. Terraced Slope: Designed drainage channels are located in the slope at regular intervals and have a regular cross-section including slope and depth requirements. Locate intersecting channels to convey storm water to the bottom of the slope. The maximum slope height between terraces shall be 30 feet for cut slopes and 25 feet for fill slopes. Terrace widths should be at least

6 feet wide. Refer to the Tennessee Erosion and Sediment Control Handbook, latest edition for detailed example of a terraced slope.

5. Seeding: Roughened areas shall be seeded and mulched as soon as possible to obtain optimum seed germination and seeding growth. Refer to Specifications for temporary mulching, vegetation in this Specification and permanent vegetation in Section 32 92 19, Loaming and Seeding.

P. Temporary Mulching

1. When mulch is used without seeding, mulch shall be applied to provide full coverage of the exposed area. Mulch shall be applied as follows:
  - a. Dry straw or hay mulch and wood chips shall be applied uniformly by hand or by mechanical equipment.
  - b. If the area will eventually be covered with perennial vegetation, 20-30 pounds of nitrogen per acre in addition to the normal amount shall be applied to offset the uptake of nitrogen caused by the decomposition of the organic mulches.
  - c. Apply mulch binder on exposed areas, where indicated on the Drawings or as instructed by the Engineer.
2. Anchoring Mulch:
  - a. Straw or hay mulch can be pressed into the soil with a disk harrow with the disk set straight or with a special "packer disk." Disks may be smooth or serrated and should be 20 inches or more in diameter and 8 to 12 inches apart. The edges of the disk should be dull enough not to cut the mulch but to press it into the soil leaving much of it in an erect position.
  - b. Straw or hay mulch shall be anchored immediately after application.
  - c. Straw or hay mulch spread with special blower-type equipment may be anchored with emulsified asphalt (Grade AE-5 or SS-1). The asphalt emulsion shall be sprayed onto the mulch as it is ejected from the machine. Use 100 gallons of emulsified asphalt and 100 gallons of water per ton of mulch.
  - d. For straw or hay mulch, plastic mesh or netting with mesh no larger than one inch by one inch shall be installed according to manufacturer's specifications.
  - e. Netting of the appropriate size shall be used to anchor wood waste. Openings of the netting shall not be larger than the average size of the wood waste chips.

Q. Temporary Grassing

1. Seed Bed Preparation:
  - a. When a hydraulic seeder is used, seedbed preparation is not required.
  - b. When using conventional or hand seeding, seedbed preparation is not required if the soil material is loose and not sealed by rainfall.
  - c. When soil has been sealed by rainfall or consists of smooth cut slopes, the soil shall be pitted, trenched or otherwise scarified to provide a place for seed to lodge and germinate.

2. Select a grass or grass-legume mixture suitable to the area and season of the year.
3. Seed shall be applied uniformly by hand, cyclone seeder, drill, culti-packer-seeder, or hydraulic seeder (slurry including seed and fertilizer). Drill or cultipacker seeders should normally place seed one-quarter to one-half inch deep. Appropriate depth of planting is ten times the seed diameter.
4. Soil should be "raked" lightly to cover seed with soil if seeded by hand.
5. Irrigation: During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to a depth that will insure germination of the seed. Subsequent applications should be made when needed.
6. Temporary Stabilization: Temporary stabilization shall be provided as shown on the Drawings and conforming to these Specifications to control erosion on the site. Temporary stabilization shall be provided to any area which will not receive permanent stabilization within the next 7 calendar days.

R. Permanent Grassing and Sodding

1. Refer to Section 32 92 19, Loaming and Seeding, for installation and maintenance.
2. Permanent Stabilization:
  - a. Permanent stabilization shall be provided as shown on the Drawings and conforming to these Specifications to control erosion on the site. Permanent stabilization shall be provided to all areas of land disturbance within seven calendar days of the completion of land disturbance for any area greater than 0.25 acre.
  - b. Grass or sod removed or damaged in residential areas shall be replanted with the same variety within seven calendar days of the completion of work in any area.
  - c. Where permanent stabilization cannot be immediately established because of an inappropriate season, the Contractor shall provide temporary stabilization. The Contractor shall return to the site at the appropriate season to provide permanent stabilization in areas that received only temporary stabilization.

S. Turbidity Curtains

1. Installation:
  - a. In calm waters, such as lakes and ponds, set the curtain end stakes or anchor points (using anchor buoys if bottom anchors are employed), then tow out the curtain in the furled condition and attach it to these stakes or anchor points. Following this, any additional stakes or buoyed anchors required to maintain the desired location of the curtain shall be set, and these anchor points made fast to the curtain. Only then shall the furling lines be loosened to let the curtain skirt drop.



- b. In rivers or in other moving water, set all the curtain anchor points. Care must be taken, prior to putting the furled curtain into the water, to ensure that anchor points are of sufficient holding power to retain the curtain under the existing current conditions. Anchor buoys shall be employed on all anchors to prevent the current from submerging the flotation at the anchor points. If the moving water into which the curtain is being installed is tidal and will subject the curtain to currents in both directions as the tide changes, provide anchors on both sides of the curtain. Once the anchors are secure, the furled curtain shall be secured first to the anchor point that is farthest upstream, then attached sequentially to each downstream anchor point in turn until the entire curtain is in position. At this point, and before unfurling, the "lay" of the curtain shall be assessed and any necessary adjustments made to the anchors. Finally, when the location is ascertained to be as desired, the furling lines shall be loosened to allow the skirt to drop.
        - c. Attach anchor lines to the flotation device, not to the bottom of the curtain.
2. Removal:
  - a. Protect the silt curtain skirt from damage by furling the curtain before it is removed from the water.
  - b. The site selected to bring the curtain ashore should be free of sharp rocks, broken cement, debris, etc., so as to minimize damage when hauling the curtain over the area.
  - c. If the curtain has a deep skirt and no furling system, it shall be protected by running a small boat with a crew installing furling lines along its length
3. Maintenance:
  - a. The Contractor is responsible for maintenance of the turbidity curtain for the duration of the Project in order to ensure the continuous protection of the watercourse.
  - b. Should repairs to the geotextile fabric become necessary, there are repair kits available from the manufacturer, and their instructions shall be followed to ensure the adequacy of the repair.
  - c. When the curtain is no longer required, as determined by the Engineer, the curtain and related components shall be removed in such a manner as to minimize turbidity. Remaining sediment shall be sufficiently settled before removing the curtain. Sediment shall be removed and the original depth (or plan elevation) restored. Any spoils shall be taken to an upland area and be stabilized.

#### T. Sediment Traps

1. Installation:
  - a. The embankment should be compacted in 6-inch layers by traversing with construction equipment.
  - b. All cut and fill slopes should be 2:1 or less (except for excavated, wet storage area which may be at a maximum 1:1. grade).
  - c. Construction operations should be carried out in such a manner that erosion during construction of the structure is minimized.

- d. The earthen embankment should be seeded with temporary or permanent seeding immediately after installation.
2. Removal: The structure should be removed and the area stabilized when the upslope drainage area has been stabilized.
  3. Maintenance:
    - a. Sediment should be removed and the trap restored to its original dimensions when the sediment has accumulated to one half the design volume of the wet storage. Sediment removal from the basin should be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.
    - b. Maintenance needs identified in inspections or by other means should be accomplished before the next storm event if possible, but in no case more than seven days after the need is identified.

### 3.03 CLEAN-UP

- A. Dispose of all excess erosion and sedimentation control materials in a manner satisfactory to the Engineer.
- B. All temporary erosion control measures shall be removed after final stabilization of the site has occurred, unless otherwise noted on the Drawings or instructed by the Engineer.
- C. 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

### 1.01 DESCRIPTION

- A. The work covered in this section consists of implementing best management practices (BMPs) to prevent and minimize erosion and resultant sedimentation in all disturbed areas during and after construction. The Contractor shall furnish all material, labor and equipment necessary for the proper installation, maintenance, monitoring, reporting and removal (where applicable) of erosion prevention and control measures and to cause compliance with the General NPDES Permit for Discharges of Storm Water Associated with Construction Activities: Permit No. TNR100000.
- B. Related Work:
1. Erosion and Sediment Control - Section 01 57 13
  2. Loaming and Seeding – Section 32 92 19
  3. Storm Water Pollution Prevention Plan (SWPPP)

### 1.02 SUBMITTALS

- A. The following submittals shall be made in accordance with the requirements of this Section and of the NPDES Permit as applicable:
1. Notice of Intent (NOI)
  2. Credentials of Certified Personnel
    - a. Prior to construction activities, the Contractor shall submit to the Owner in writing the name(s) of the Contractor's designated Certified Personnel and shall provide credentials indicating that the named Certified Person has completed an appropriate erosion and sediment courses that fulfills the requirements of the NPDES Permit.
    - b. The Owner reserves the right to reject any candidate it deems unqualified for the position and, furthermore, may require the Contractor to replace an unqualified individual with a suitable substitute at anytime throughout the life of the Project, at no additional cost to the Owner.
  3. Inspection Checklists and Reports
  4. Monitoring Reports
  5. Notice of Termination (NOT)
- B. Shop drawings and product data for materials furnished under the ES&PC Plan and this Section shall be submitted to the Owner in conformance with the requirements of

Section 01 33 23 (Shop Drawings, Product Data and Samples) of these Specifications.

### 1.03 REFERENCES

- A. Contractor shall be familiar with the following referenced documents. These documents shall be complied with as applicable.
1. General NPDES Permit for Discharges of Storm Water Associated with Construction Activities: Permit No. TNR100000.
  2. Tennessee Erosion and Sediment Control Handbook (latest edition).
  3. State of Tennessee Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.
  4. Local Issuing Authority's Soil Erosion and Sedimentation Control Ordinances.
  5. SWPPP as required by the NPDES Permit.
- B. The General NPDES Permit for Discharges of Storm Water Associated with Construction Activities: Permit No. TNR100000 is incorporated into these Specifications by reference. A copy of the permit may be downloaded from the Tennessee Department of Environment & Conservation's website:

<http://www.state.tn.us/environment/permits/conststrm.shtml>

### 1.04 DEFINITIONS

- A. Design Professional: For the purpose of this Section the term Design Professional is synonymous with consulting engineer, licensed professional, designer, and consultant used in permits, laws, rules, regulations, ordinances and other soil erosion and sediment control references. For the purposes of this Specification the Owner may at any time during the Project provide direction. This direction shall be considered equivalent to direction from the Design Professional.
- B. Engineer: For the purposes of this Section the term Engineer refers to a person or representative for the Owner performing construction oversight and managing construction activities and inspections.
- C. Contractor: For the purposes of this Section the term Contractor is synonymous with General Contractor, Discharger, Operator, Primary Permittee and Permittee (permit holder) as used in permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references.
- D. Certified Personnel or Certified Person: For the purposes of this Section, the terms Certified Personnel and Certified Person mean a person who has successfully completed an erosion and sediment controls short course eligible for continuing education units, or an equivalent course approved by Tennessee Department of Environment & Conservation.

- E. Other Definitions: Definitions as listed in the NPDES Permit shall apply in this Section.

## 1.05 REGULATORY COMPLIANCE

- A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Tennessee, and/or Local Issuing Authority. The Contractor is the operator, and therefore a Co-Primary Permittee, under the provisions of the NPDES Permit. As such, Contractor will be required to sign certain certifications as described in the NPDES Permit. Contractor shall comply with requirements specified in the Contract Documents or by the Owner. Contractor shall also comply with all other laws, rules, regulations, ordinances and requirements concerning soil erosion and sediment control established in the United States, the State of Tennessee, and/or Local Issuing Authority. The following documents and the documents referenced therein define the regulatory requirements for this Section.
1. NPDES Permit: The Tennessee General NPDES Permit for Discharges of Storm Water Associated with Construction Activities: Permit No. TNR100000 governs land disturbance or construction activities of one acre or more. On applicable sites, the Contractor is responsible for complying with terms and conditions of this permit.
  2. "Tennessee Erosion and Sediment Control Handbook", latest edition: Contractor shall follow Practices and Standards of the Tennessee Erosion and Sediment Control Handbook.
- B. The Contractor is responsible for any applicable fees associated with NPDES Permit.
- C. Fines resulting from non-compliance with the NPDES permit shall be paid by the Contractor at no additional expense to the Owner.

## PART 2 PRODUCTS

- A. As specified in the SWPPP, Section 01 57 13, and Section 32 92 19.

## PART 3 EXECUTION

### 3.01 NOTICE OF INTENT (NOI)

- A. The NOI shall be signed by the Contractor as Co-Primary Permittee in accordance with the Signatory Requirements of the NPDES Permit and returned to the Owner for submission to EPD. A copy of the NOI may be downloaded from the Tennessee Department of Environment & Conservation's website:

<http://www.state.tn.us/environment/permits/conststrm.shtml>

- B. The NOI must be submitted in accordance with the NPDES Permit prior to the start of construction activities. The Contractor may not start construction activities until written authorization from Tennessee Department of Environment & Conservation is received in the form of a letter of coverage under the terms and conditions of the NPDES Permit.

### 3.02 INSTALLATION

- A. Erosion control measures shall be installed as shown on the Contract Drawings and in accordance with Section 01 57 13: Erosion and Sediment Control, and Section 32 92 19: Loaming and Seeding.
- B. Rainfall and storm water monitoring equipment shall be installed as identified in the SWPPP and/or as shown on the Contract Drawings.

### 3.03 INSPECTIONS AND REPORTING

- A. The Engineer who prepared the SWPPP shall inspect the installation of the erosion control measures within one week after initial construction activities begin. The Engineer shall notify the Primary Permittee of any deficiencies. The Contractor must correct all deficiencies within two business days of receipt of the Engineer's inspection report.
- B. The Contractor will designate a Certified Person who shall perform all inspections required by the NPDES Permit and this Specification.
- C. Reports
  - 1. All inspections shall be summarized in a report. A sample inspection checklist is included at the end of this Section for the Contractor's reference and/or use.
  - 2. Reports shall identify any deficiencies and incidents of non-compliance, major observations relating to the SWPPP, and any revisions or amendments to the SWPPP. Where incidents of non-compliance are not identified within the report, the report shall contain a certification that the facility is in compliance with the SWPPP and the NPDES Permit.
  - 3. All inspection reports shall contain a summary of the inspection, the name and signature of the Certified Person making the inspection, and the date of the inspection.
  - 4. All inspection reports shall be submitted to the Owner or the Engineer on a weekly basis for review and retention. The Owner may withhold payments to the Contractor if such reports are not submitted in a timely manner.
  - 5. All reports shall contain signed certification statements as required by the NPDES Permit.
  - 6. Inspection documentation will be maintained on site and made available upon request. Inspection reports must be submitted to the Tennessee Department of

Environment & Conservation within 10 days of the request. Permittees discharging into impaired or high quality waters are required to use the inspection form provided in Appendix C of the NPDES Permit.

### 3.04 MAINTENANCE

- A. Erosion and sediment controls as described in these Contract Documents shall be maintained in good working condition throughout the life of the project. Any part of the erosion and sediment control components found to be damaged or defective shall be promptly repaired or replaced.
- B. After completion of area surfacing, and with the approval of Owner or Engineer, the Contractor shall remove and dispose off-site all temporary erosion control measures and shall restore the ground to its original condition.

### 3.05 MONITORING AND REPORTING

- A. The Contractor shall monitor and record daily (once each twenty-four-hour period) rainfall data in accordance with the SWPPP and the NPDES Permit. Rainfall measurements shall be made at the same time each day.
  - 1. The following information shall be recorded for each daily rainfall measurement:
    - a. Project name and number
    - b. Contractor's Certified Person
    - c. Date and time
    - d. Reading and name of person taking reading
- B. The Owner reserves the right to use its own resources to duplicate monitoring and verify the work required by the Contractor in this Section.

### 3.06 NOTICE OF TERMINATION (NOT)

- A. When all construction activities have ceased, final stabilization has been implemented by the Contractor, and the site is in compliance with the NPDES permit, the Contractor shall provide a written statement to the Owner that the site is in compliance with the NPDES permit and that Contractor is prepared to sign and submit the Notice of Termination. The Owner shall make the final submittal of the Notice of Termination (NOT) to Tennessee Department of Environment & Conservation. A copy of the NOT may be downloaded from the Tennessee Department of Environment & Conservation website:

<http://www.state.tn.us/environment/permits/conststrm.shtml>

END OF SECTION

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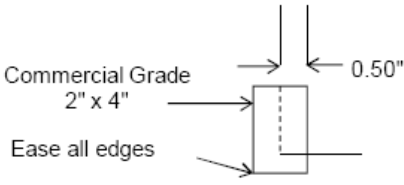
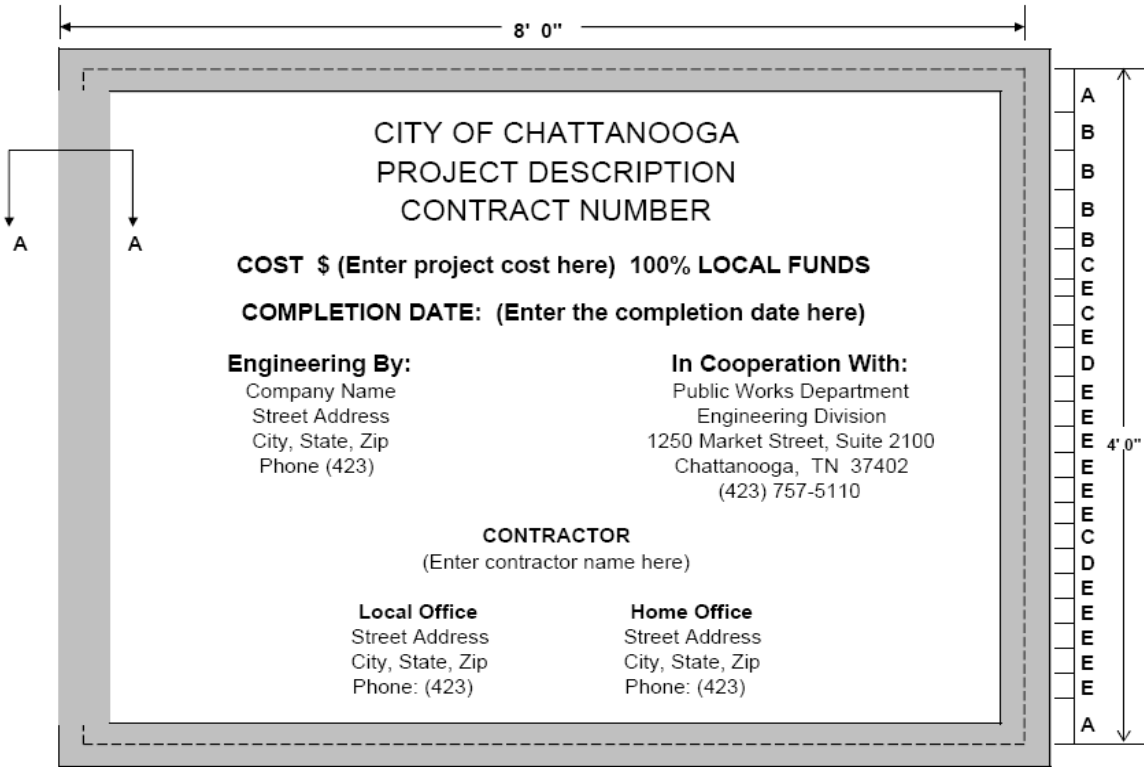


PART 1 GENERAL

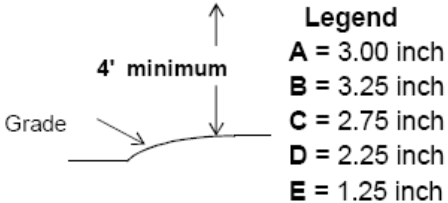
1.01 SCOPE

The Contractor shall erect two signs identifying the construction project at locations to be designated by the Engineer. The sign shall be substantially in accordance with the drawing below and shall be made of oil base paint on 3/4-inch exterior plywood and maintained in good conditions until completion of the work defined under these Contract Documents. The Contractor shall submit a layout of the sign for approval by the Engineer.

No separate payment will be made for the signs. Payment shall be included in the unit or lump sum prices bid for other sections of work.



Section A - A



Notes:

- 1. Sign to be 3/4-inch-thick exterior grade plywood.
- 2. Provide adequate supports to keep sign above prevailing grade to permit public viewing. Edge, trim, and letters shall be dark blue; background shall be white.

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## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

### 1.02 TRANSPORTATION AND DELIVERY

- A. Transport and handle items in accordance with manufacturer's instructions.
- B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
- C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.
- F. Provide necessary equipment and personnel to unload all items delivered to the site.
- G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct and items are undamaged. For items furnished by others (i.e., Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.
- H. If any item has been damaged, such damage shall be repaired at no additional cost to the Owner.

### 1.03 STORAGE AND PROTECTION

- A. Store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer by him/her. Instruction shall be carefully followed and a written record of this kept by the Contractor. Arrange storage to permit access for inspection.
- B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

- C. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking and spalling to a minimum.
- D. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.
1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.
  2. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.
  3. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.
  4. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.
- E. All paint and other coating products shall be stored in areas protected from the weather. Follow all storage requirements set forth by the paint and coating manufacturers.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

END OF SECTION

## PART 1 GENERAL

### 1.01 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 of these Specifications.

### 1.02 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.

### 1.03 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.
- C. Construction Surveying Cash Allowance
  - 1. This 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.
  - 2. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks, verifying that the work has been performed accurately, and all other work covered by this Section.

### 1.04 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. Written certification, by a licensed surveyor, that structure base grade and structure corner locations match the locations shown on the Drawings is required prior to beginning construction of the structure.
- C. 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.

### 1.05 FORCE MAINS AND ACCESSORIES

- A. Staking Precision: The precision of construction staking required shall be that which the correct location of the main can be established for construction and verified by the Engineer. Where the location of components of the main, e.g. fittings, valves, road crossings and are not dimensioned, the establishment of the location of these components shall be based upon scaling these locations from the Drawings with relation to readily identifiable land marks, e.g., survey reference points, power poles, manholes, etc.

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B. Reference Points

1. Reference points shall be placed, at or no more than three feet, from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use, prior to verifying reference point locations. Distances shall be accurately measured to 0.01 foot.
2. 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.

## 1.06 SEWERS AND ACCESSORIES

A. Staking Precision: The precision of construction staking shall be no less than 1:10,000. Horizontal distances shall be measured with a precision no less than 0.01 feet, and horizontal angles measured with a precision of no less than 10 seconds.

B. Reference Points

1. The surveyor shall obtain the coordinates on each manhole and provide this information to the Engineer.
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.

END OF SECTION

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**SECTION 01 72 00  
PROJECT RECORD DOCUMENTS**

**1.1 GENERAL**

- A. The Contractor shall maintain accurate record documents related to the furnishing and installation of equipment, materials, and products at the site of the project during the course of the work.
- B. Contractor shall prepare and submit cut sheets for the Engineer's approval prior to starting construction. No separate payment is allowed for this item.

**1.2 MAINTENANCE OF DOCUMENTS**

- A. The Contractor shall maintain at the project site one (1) record copy of each of the following:
  - 1. Contract Drawings
  - 2. Specifications
  - 3. Addenda
  - 4. Reviewed Shop Drawings
  - 5. Change Orders
  - 6. Other Modifications to Contract Documents
  - 7. Field Test Records

Project record documents shall be stored in suitable files and racks in a location satisfactory to the Engineer. The documents shall be maintained in a clean, dry, legible condition and shall not be used for construction purposes.

**1.3 RECORDING**

The Contractor shall label each document "Project Record" in one-inch high letters. Record Documents shall be kept current and work shall not be permanently concealed until the required information had been recorded.

- A. Contract Drawings: The Contractor shall legibly mark to record the actual construction on the project record set of prints of the Contract Drawings, including reviewed shop drawings, the following:
  - 1. Horizontal and vertical location of underground utilities and appurtenances referenced to mean sea level or permanent surface improvements.
  - 2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
  - 3. Field changes of dimension and detail, including elevations of foundations.
  - 4. Changes made by change order or field order.
  - 5. Details not on original Drawings.
- B. Specifications and Addenda: - The Contractor shall legibly mark up 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 change order or field order.
3. Other matters not originally specified.

C. Sanitary Sewer/Stormwater Structural Locations:

1. All sanitary sewer manholes, conveyances, pressurized mains and lift stations should be located by the center. English units and NAD 83 State Plane Coordinates shall be used. All applicable information required for each item on the "Sanitary Sewer Electronic Data Submittals - Explanation and Data Sheet" forms (pages 01720-3 - 01720-10) should be completed in Microsoft ® Excel format and submitted to the Technical Information Center (TIC) office. These forms will be provided by the TIC office on floppy disk.
2. All stormwater conveyances, structures and detentions should be located by the center. English units and NAD 83 State Plane Coordinates shall be used. All applicable information required for each item on the "Stormwater Electronic Data Submittals - Explanation and Data Sheet" forms (pages 01720-11 - 01720-16) should be completed in Microsoft ® Excel format and submitted to the Technical Information Center (TIC) office. These forms will be provided by the TIC office on floppy disk.

TIC office will utilize this information in updating the City of Chattanooga GIS System.

- D. Sewer Line Television - All new lines shall be videotaped following construction. Tee locations shall be marked. The Owner shall be given a copy of the videotape.

#### 1.4 SUBMITTALS

- A. As-Built Drawings – Certified As-Built drawings shall be submitted at the end of the project. Minimum requirements include plan and profile, tee locations, scale, alignment angles, invert elevations, and easements. The final record drawing shall be submitted on disk, with certification of the engineer or surveyor, and digital CAD file in AutoCAD ® format.

At the completion of the work and prior to final acceptance by the Owner, the Contractor shall deliver the Project Record Documents to the Engineer. The Project Record Documents shall be acceptable to the Engineer before final payment is made.

With the submittal of the Project Record Documents, the Contractor shall submit a list of each document submitted and a certification that each document as submitted is complete and accurate.

END OF DOCUMENT

## SECTION 01 72 00

## PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Manhole Field Explanation

Item Name	Units	Description	Drop-down Menu Options
LegacyID		ID from previous Source	
RimElevation	Feet	Elevation at Rim of Manhole	
BarrelDiameter	Feet	Barrel (riser) diameter (ft) - default is 4 / change to "riser diameter" on data entry	
AccessDiameter	Inches	Lid Diameter	18,24 Default, 30
ConeHeight	Feet	Height of Cone above Ground	
VentHeight	Feet	Vent Height Above Manhole cover	
Depth	Feet	Depth of Manhole	
HighPipeDepth1	Feet	Depth of Manhole	
HighPipeDepth2	Feet	Depth of Manhole	
HighPipeDepth3	Feet	Depth of Manhole	
VentDiameter	Inches	Diameter of Vent Pipe	3, 4, 6, other
VentElevation	Feet	Elevation of top of vent	
Elevation	Feet	Invert elevation of manhole (if more than one # is shown , invert is always lowest # (rim elevation - depth)	
HighPipeElevation1	Feet	Elevation of High Pipe	
HighPipeElevation2	Feet	Elevation of High Pipe	
HighPipeElevation3	Feet	Elevation of High Pipe	
InstallContractor	mm/dd/yyyy	Construction Contractor	
WarrantyDate	mm/dd/yyyy	Warranty expiration date	
Manufacturer	mm/dd/yyyy	Manhole Manufacturer	
InstallDate	mm/dd/yyyy	Approx. date of substantial completion or date S/D was released	
Subtype		Type of Manhole - Can have multiple types	Vented, Odor Control, Flow Measurement, Air Release Valve, Junction Structure, Lamp Hole, Regulating Chamber, T-Base, Drop Manhole, Siphon Chamber,Other,Unknown
BarrelMaterial		Manhole barrel (riser) material	Brick, Concrete, Concrete with Brick, Lined, Plastic, Other, Unknown
VentMaterial		Vent Material	Steel, Ductile Iron, PVC, Other
NoPipeinflow	#	Number of pipes that flow into the structure	0, 1, 2, 3, 4, 5, 6, 7, 8
NoPipeoutflow	#	Number of pipes that flow out of the structure	0, 1, 2, 3, 4, 5, 6, 7, 8
AboveGrade		Is structure above grade?	True, False
Step		Are steps present	Yes, No, Unknown
PavingRing		Is a paving ring present?	Yes, No
AccessMaterial		Lid material	Metal, Concrete, Missing, Other, Unknown
LidType		Type of lid on Manhole	Solid Lid, Grated Lid, Bolted lid, Watertight Lid, Unknown
FrameMaterial		Frame material for lid	Concrete, Metal, Other, Unknown
BarrellMaterial		Manhole cone material	Brick, Concrete, Concrete with Brick, Lined, Plastic, Other
ConeType		Manhole cone type	Eccentric, Concentric, Flat Top, Chimney, Unknown
AccessType		Type of access	Lid, Hatch, Other
WaterType		Type of water structure is carrying	Combined Waste Water, Sanitary Sewer, Storm Runoff, Reclaimed, Unknown
GroundType		Predominant surface cover type	Asphalt, Concrete, Gravel, Soil, Grass, Brick Pavers, Building, Other, Unknown
Northing	#	Auto Calculation from Latitude	
Easting	#	Auto Calculation from Longitude	
DataSource			Aerial Photography, GPS Survey, Traditional Survey, Development Plans, Other

SECTION 01 72 00

PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Manhole Data Sheet

Item Name	Manhole 1	Manhole 2	Manhole 3	Manhole 4	Manhole 5	Manhole 6	Manhole 7
LegacyID							
RimElevation							
BarrelDiameter							
AccessDiameter							
ConeHeight							
VentHeight							
Depth							
HighPipeDepth1							
HighPipeDepth2							
HighPipeDepth3							
VentDiameter							
VentElevation							
Elevation							
HighPipeElevation1							
HighPipeElevation2							
HighPipeElevation3							
InstallContractor							
WarrantyDate							
Manufacturer							
InstallDate							
Subtype							
BarrelMaterial							
VentMaterial							
NoPipeinflow							
NoPipeoutflow							
AboveGrade							
Step							
PavingRing							
AccessMaterial							
LidType							
FrameMaterial							
BarrellMaterial							
ConeType							
AccessType							
WaterType							
GroundType							
Northing							
Easting							
DataSource							

## SECTION 01 72 00

## PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Conveyance Explanation

Item Name	Units	Description	Drop-down Menu Options
WaterType		Type of water structure is carrying	Sanitary Sewer, Combined, Storm Runoff, Reclaimed, Unknown
WarrantyDate	mm/dd/yyyy	Warranty expiration date	
US_ID	#	ID of link or node immediately upstream of this link	
UpstreamInvert	Inches	Invert elevation at upstream end of pipe	
DownstreamInvert	Inches	Invert elevation at downstream end of pipe	
Subtype		Main type	Bypass, Collector, Combined Sewer, Force Main, Interconnect, Interceptor, Outfall, Outfall for Combined Sewer, Relief Main, Siphon
Slope	Feet	Actual slope (FT/FT) calculated as $(us\_elevation - ds\_elevation) / actual\_length$	
PipeWidth	Inches	Width of pipe if not round or width at maximum point if elliptical or egg shaped	
PipeLength	Feet	Measured length of the main (horizontal measure, in feet), system will automatically calculate the actual length of the line feature	
PipeHeight	Inches	Height of pipe if not round or Height at maximum point of pipe if elliptical or egg shaped	
PipeDiameter	Inches	Diameter of round pipe	6,8,10,12,15,16,18,21,24,30,36,42,48,60,66,72,84,96, other
PipeCount		# of pipes coming into Manhole	
OtherDiameter	Inches	Diameter of pipe if other defined on PipeDiameter, Manual Entry	
Material		Construction material	Clay, Concrete, PVC, DIP, Brick, HDPE, Lined, Unknown, Cast Iron, Asbestos Concrete
Location		Users' description of feature's location - appears on plan - if not a subdivision, put down nearest major road	
LegacyID		Microfilm Number	
JointType1		Type of joint used to join mains together	Ball, Bell and Spigot, Flanged, Mechanical, Push on, Sleeved, Threaded
InstallDate	mm/dd/yyyy	Approx. date of substantial completion or date S/D was released	
InstallContractor	mm/dd/yyyy	Construction Contractor	
GroundType		Predominant surface cover type	Asphalt, Concrete, Gravel, Soil, Grass, Brick Pavers, Building, Other, Unknown
DS_ID	#	ID of link or node immediately downstream of this link	
DataSource			Aerial Photography, GPS Survey, Traditional Survey, Development Plans, Other
CrossSectionShape		Shape of the Main	Circular, Egg Shaped, Rectangular Channel, Elliptical, Other

SECTION 01 72 00

PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Conveyance Data Sheet

Item Name	Pipe1	Pipe2	Pipe3	Pipe4	Pipe5	Pipe6	Pipe7
WaterType							
WarrantyDate							
US_ID							
UpstreamInvert							
Subtype							
Slope							
PipeWidth							
PipeLength							
PipeHeight							
PipeDiameter							
PipeCount							
OtherDiameter							
Material							
Location							
LegacyID							
JointType1							
InstallDate							
InstallContractor							
GroundType							
DS_ID							
DownstreamInvert							
DataSource							
CrossSectionShape							

## SECTION 01 72 00

## PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Pressurized Main Explanation

Item Name	Units	Description	Drop-down Menu Options
Legacy_ID		Office Generation	
Originating PS		Originating Pump Station	
Discharge MH		Manhole that force main discharges to	
Recorded Length	Feet	Length of the Pressurized main	
Diameter	Feet	Diameter of main	
Depth	Feet	Depth of main	
Install Date	mm/dd/yyyy	Approx. date of substantial completion or date S/D was released	
Warranty Date	mm/dd/yyyy	Warranty expiration date	
Install Contractor	mm/dd/yyyy	Construction Contractor	
Water Type		Type of water structure is carrying	Sanitary, Combined, Storm Runoff
Force Main Material		Construction material	DIP, PVC, HDPE, RCPP, Steel, Other
Exterior Coating			Tar, Unknown, Other
JointType1		Type of joint used to join mains together	Ball, Bell and Spigot, Flanged, Mechanical, Push on, Sleeved, Threaded
Lining Type		Pipe Liner	Cement, PVC, HDPE, Teflon, Epoxy, Other
Location		Users' description of feature's location appears on plan - if not a subdivision, put down nearest major road	
Ground Type		Predominant surface cover type	Asphalt, Concrete, Gravel, Soil, Sand, Grass, Brick Pavers, Building, Other
Design Flow			
Data Source			Aerial Photography, GPS Survey, Traditional Survey, Development Plans, Other
Surge ReliefValve		Is there a surge relief valve	Yes, No
Surge ReliefValve Size		Size of surge relief valve	
Air Release Valve			Yes, No
Vacume release valve			
Air release x Coord			
Air release y Coord			
Surge ReliefValve x Coord			
Surge ReliefValve y Coord			
Vacume release valve x coord			
Vacume release valve y coord			

SECTION 01 72 00

PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Pressurized Main Data Sheet

Item Name	Main1	Main2	Main3	Main4	Main5	Main6	Main7
Legacy_ID							
Originating PS							
Discharge MH							
Recorded Length							
Diameter							
Depth							
Install Date							
Warranty Date							
Install Contractor							
Water Type							
Force Main Material							
Exterior Coating							
JointType1							
Lining Type							
Location							
Ground Type							
Design Flow							
Data Source							



**SECTION 01 72 00**  
**PROJECT RECORD DOCUMENTS**  
**Sanitary Sewer Electronic Data Submittals**  
**Lift Station Explananation**

Item Name	Units	Description	Drop-down Menu Options
LegacyID		Office Generation	
WetWellRimElevation	Feet	Elevation of rim on Wet Well	
WetWellDepth	Feet	Depth of wet well	
WetWellAccessDiameter	Feet	Diameter of Wet Well Access	
PumpCapacity		Capacity at given head	
ElevationAtBottom	Feet	Elevation at bottom of pump	
AverageFlow		Average flow through pump station	
PeakFlow		Peak flow through pump station	
WetWellCapacity	Gallons		
InstallDate	mm/dd/yyyy	Approx. date of construction or date S/D was released	
WarrantyDate	mm/dd/yyyy	Warranty date of the feature - Blank unless known	
InstallContractor	mm/dd/yyyy	Construction Contractor	
LiftStationName		Name of lift Station	
WasteWaterPumpSubtype		Type of pump in lift station	Standard Centrifugal, Submersible, Self-Priming Centrifugal, Dry Pit Vertical Centrifugal
OverflowAlarm		Verify if Alarm is present	True , False
LevelSensorType		Level Sensor type for pump station	Air Bubble, Enclosed Electrode, Electrode, Float, Micro Processor, Transducer, Ultrasonic, Unknown, Other
WetWellBarScreen		Bar Screen	True, False
WetWellMaterial		Material of wet well	Brick, Poured Concrete, Concrete and Brick, Fiberglass, Lined, Polyethylene, Precast concrete, Unknown, Other
WetWellStepMaterial		Material that steps are made of in wet well	PVC coated Cast Iron, Cast Iron, Other
WetWellAccessType		Type of access to wet well	Door, Grate, Hatch, Lid, Manhole Cover, Other, Unknown
NumberofPumps		Numbers of Pumps	
PumpSize1		Hp at given head	
PumpSize2		Hp at given head	
PumpSize3		Hp at given head	
PumpSize4		Hp at given head	
PumpSize5		Hp at given head	
PumpSize6		Hp at given head	
PumpSize7		Hp at given head	
WetWellAccessMaterial		Material that Wet Well Access is made of	Cast Iron, Aluminum, Concrete, Unknown, Other
WetWellLiner		Lining material of Wet Well	Tar, PVC, Unknown, Other
WaterType		Type of water structure is carrying	Combined Waste Water, Reclaimed, Sanitary Sewer, Storm Runoff
WetWellRingMaterial		Material of wet well ring	Brick, concrete, Reinforced Concrete, Unknown, Other
WetWellFrameMaterial		Frame material of wet well	Metal, Concrete, Other, Unknown
OperationalDate	mm/dd/yyyy	Date in which lift station became operational	
SecondaryPower		Source of Secondary Power	Dedicated Generator, Portable Generator, Dual Power Feed, Battery, Others
DataSource			Aerial Photography, GPS Survey, Traditional Survey, Development Plans, Other
AutoLevelController			True, False
Agency		Indicator of who inventoried the pipe	City, CTI, AGM, Other,
SCADA		Type of SCADA connection	RTU, Telephone, Satellite, Wireless, Spread Spectrum, Other
Modem			True, False
PowerSupplier		Electrical Service Supplier	EPB, NWGA, Other

SECTION 01 72 00

PROJECT RECORD DOCUMENTS

Sanitary Sewer Electronic Data Submittals  
Lift Station Data Sheet

Item Name	LiftSatation1	LiftSatation2	LiftSatation3	LiftSatation4	LiftSatation5	LiftSatation6	LiftSatation7
LegacyID							
WetWellRimElevation							
WetWellDepth							
WetWellAccessDiameter							
PumpCapacity							
ElevationAtBottom							
AverageFlow							
PeakFlow							
WetWellCapacity							
InstallDate							
WarrantyDate							
InstallContractor							
LiftStationName							
WasteWaterPumpSubtype							
OverflowAlarm							
LevelSensorType							
WetWellBarScreen							
WetWellMaterial							
WetWellStepMaterial							
WetWellAccessType							
NumberofPumps							
PumpSize1							
PumpSize2							
PumpSize3							
PumpSize4							
PumpSize5							
PumpSize6							
PumpSize7							
WetWellAccessMaterial							
WetWellLiner							
WaterType							
WetWellRingMaterial							
WetWellFrameMaterial							
OperationalDate							
SecondaryPower							
DataSource							
AutoLevelController							
Agency							
SCADA							
Modem							
PowerSupplier							

## PART 1 GENERAL

### 1.01 SCOPE

- A. The work under this Section includes, but is not necessarily limited to, cutting and patching work as indicated on the Drawings, herein specified and as necessary for proper and complete performance of the work.
- B. Requirements for cutting and patching may be described in various sections of these Specifications.
- C. Execute cutting, including excavating and filling, or patching of work required to:
  - 1. Make several parts fit properly.
  - 2. Uncover work to provide for installation of ill-timed work.
  - 3. Remove and replace defective work.
  - 4. Remove and replace work not conforming to requirements of the Contract Documents.
  - 5. Remove samples of the installed work as specified for testing.
  - 6. Install specified work in existing construction.
- D. In addition, upon written instruction of the Engineer:
  - 1. Uncover work to provide for the Engineer's observation of covered work.
  - 2. Remove samples of the installed materials for testing.
  - 3. Remove work to provide for alteration of existing work.
- E. Protection of Work:
  - 1. Do not endanger any work by cutting or altering the work or any part of it.
  - 2. Do not cut or alter the work of another contractor without written consent of the Engineer.

### 1.02 SUBMITTALS

- A. Prior to cutting which affects the structural safety of the Project or the work of another contractor, submit a written notice to the Engineer requesting consent to proceed with cutting. The notice shall include:
  - 1. Identification of Specific Project Items (e.g., pipe ID or manhole ID).

2. Description of defective work.
  3. Necessity for cutting.
  4. Affect on other work or on the structural integrity of the Project.
  5. Description of the proposed work including:
    - a. Scope of cutting and patching;
    - b. Subcontractor and trades to execute work;
    - c. Products proposed to be used;
    - d. Extent of refinishing.
  6. Alternatives to cutting and patching.
  7. Designation of party responsible for the cost of cutting and patching.
- B. Cost Estimate: Prior to cutting and patching performed on instruction of the Engineer, submit a cost estimate.
- C. Should conditions of the work or the schedule necessitate alternative materials or methods, submit a written recommendation to the Engineer that includes:
1. Compelling conditions for alternative materials or methods;
  2. Recommended alternative materials or methods;
  3. Submittals as required for substitutions.
- D. Uncovered Work: Submit written notice to the Engineer designating the time the work will be uncovered for the Engineer's observation.

### 1.03 PAYMENT FOR COST

- A. Contractor's Costs: Costs caused by ill-timed or defective work or work not conforming to the Contract Documents, including costs for additional services of the Engineer, shall be paid by the Contractor.
- B. Owner's Costs: Cost of work done as the result of the Engineer's/Owner's instructions, which is not shown on the Drawings or specified, other than defective or non-conforming work, will be paid for by the Owner.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. All products and materials shall conform to the requirements of the Specifications for the type of work being performed, except where no products are specified in these Specifications for the item being replaced; then the products and materials shall be of an equivalent type, quality, thickness and width of the item removed.

---

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Inspect existing conditions of the work including elements subject to movement or damage during cutting and patching, or excavating and backfilling.
- B. After uncovering work, inspect conditions affecting the installation of new products.

### 3.02 PREPARATION

- A. Provide shoring, bracing and support as required to maintain structural integrity of the Project.
- B. Provide protection for other portions of the Project and provide protection from the elements.

### 3.03 PERFORMANCE

- A. Execute fitting and adjustments of products to provide finished installation that complies with specified tolerances and finishes.
- B. Execute cutting and demolition by means that will prevent damage to other work and will provide proper surfaces to receive installation of repairs and new work.
- C. Execute excavating and backfilling as specified in Section 31 20 00 or Section 31 23 33 of these Specifications.
- D. Restore work which has been cut or removed and install new products to provide completed work in accordance with the requirements of the Contract Documents.
- E. Refinish entire surfaces as necessary to provide an even finish. Continuous surfaces shall be refinished to the nearest intersection and assemblies shall be entirely refinished.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE

- A. This Section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the Project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

### 1.02 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.

### 1.03 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.

### 1.04 PROGRESS CLEANING

- A. General
  - 1. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this work.
  - 2. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
  - 3. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.
- B. Site
  - 1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
  - 2. Restack materials stored on site weekly.
  - 3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

### C. Structures

1. Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
2. Weekly, and more often if necessary, sweep all interior spaces clean. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by using a hand-held broom.
3. As required preparatory to installation of successive materials, clean the structures or pertinent portions as recommended by the manufacturer of the successive material.
4. Following the installation of finish floor materials, clean the finish floor daily. "Clean", for the purpose of this paragraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Engineer, may be injurious to the finish floor material.
5. Schedule cleaning operation so that dust and other contaminants resulting from cleaning operations will not fall on wet, recently painted surfaces.

## 1.05 FINAL CLEANING

- A. Definitions: Unless otherwise specifically specified, "clean" for the purpose of this Article shall be interpreted as the level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.
- B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in 1.04 above.
- C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.
- D. Structures
  1. Remove all traces of soil, waste material, splashed material, and other foreign matter to provide a uniform degree of exterior cleanliness. Visually inspect all exterior surfaces and remove all traces of soil, waste material, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.



2. Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all paint droppings, spots, stains and dirt from finished surfaces.
  3. Clean all glass inside and outside.
  4. Polish all surfaces requiring the routine application of buffed polish. Provide and apply polish as recommended by the manufacturer of the material being polished.
- E. Post-Construction Cleanup: All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, shall be removed as directed by the Engineer.
- F. Restoration of Landscape Damage: Any landscape feature damaged by the Contractor shall be restored as nearly as possible to or better than its original condition at the Contractor's expense. Restoration shall be performed to the satisfaction of the Engineer.
- G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept the Project.

## 1.06 CLEANING DURING OWNER'S OCCUPANCY

- A. Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Engineer in accordance with the Supplementary Conditions of the Contract Documents.

## 1.07 DISPOSAL OF WASTE

- A. Except for items or materials to be salvaged, recycled, or otherwise reused, and except for options available below for vegetative waste generated by clearing and grubbing operations, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- B. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
- C. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.
- D. Vegetative waste generated by clearing and grubbing operations may be disposed of by mulching. Timber within the areas cleared shall become the property of the Contractor. The Contractor may cut, trim, hew, saw or otherwise dress felled timber within the limits of the work area, provided all timber and all waste materials are disposed of as specified. All residual matter from mulching operations shall be removed from the Project site as waste in accordance with the provisions of this section of the Specifications.

- E. Waste removed from the Project site shall be disposed of in sites permitted by the Tennessee Department of Environment and Conservation (TDEC) for the acceptance of type of waste being disposed in accordance with Rules of TDEC Solid Waste Management, including Chapter 0400-11-01. Landfill types include:
1. Class I Landfills - municipal solid waste, household waste, shredded/waste tires;
  2. Class II Landfills - industrial waste;
  3. Class III Landfills - farming wastes, landscaping and land clearing wastes;
  4. Class IV Landfills - construction and demolition waste.
- F. Exceptions to Paragraph E are as follows:
1. Certain other wastes (such as medical/infectious waste, dead animals, sludges, pesticides wastes, hazardous wastes, asbestos) require special waste approval prior to disposal. See the TDEC Environmental Permitting Handbook for more information.
  2. Hazardous waste shall be disposed of in accordance with Rules of TDEC Solid Waste Management, including but not limited to Chapter 0400-12-01 and the rules and regulations of the United States Environment Protection Agency (EPA).
  3. Asbestos-containing waste shall also be handled and disposed in accordance with TCA 68-201-101 et seq, Rules of the Tennessee Department of Health, and TDEC Bureau of Environmental Health Services, Division of Air Pollution, including Chapter 1200-3-11-.02 and 40 CFR 61.
  4. 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.
- G. No waste shall be placed at a transfer station facility.
- H. 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.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE

- A. The work under this Section includes, but is not necessarily limited to, the provision of all labor and material required to perform installation inspection and start-up of all equipment and mechanical systems installed under this Contract.
- B. The work defined under this Section includes providing the services of a trained factory representative in accordance with the requirements of Section 01 43 33 of these Specifications.
- C. Certification of start-up and full testing shall be performed by the manufacturer using the services of a factory representative trained in this type service.
- D. Unless otherwise specified, the Contractor shall furnish all labor, materials, water, air, oil, power, fuel, chemicals, test equipment and other items required to conduct the field tests, including any retests.
- E. The cost of all field testing shall be included in the Contract Price and no separate payment will be made.

### 1.02 COORDINATION

- A. The Contractor shall not proceed with any functional test or operating test until the operation and maintenance manuals for the equipment have been submitted and been designated "No Exceptions Taken". The Contractor shall coordinate all activities required for starting of systems including the visits by the factory representatives, particularly where an equipment item's operation is dependent on the operation of other equipment. Prior to calling the factory representative, the Contractor shall ensure that all necessary related equipment, structures, piping and electrical work is complete. Any required revisits to the site by the factory representative shall be provided by the Contractor.

### 1.03 PRE START-UP MAINTENANCE

- A. After installation and prior to start-up, all grease-lubricated joints, shaft couplings and bearings shall be flushed out and re-greased. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. All operating fluid and gas reservoirs shall be filled with the proper fluid and gases. Screens and filters shall be checked for contamination and replaced if necessary. Belt drives shall be checked and tension adjusted, as needed. The equipment shall then be tagged, signed and dated, indicating that the equipment has been properly lubricated and prepared for start-up.

## 1.04 INSTALLATION INSPECTION

- A. Prior to energizing any piece of equipment or performing a functional test, a factory representative of the equipment manufacturer shall inspect the installation of the equipment. The factory representative shall determine if the equipment has been installed in accordance with the manufacturer's recommendations, pre-start-up maintenance has been performed, and is ready for start-up and the initiation of the functional test.
- B. Should the installation inspection indicate that the equipment has been improperly installed or prepared for start-up, the Contractor shall provide such modifications or adjustments as required for the equipment to operate properly.
- C. The factory representative shall certify that the equipment has been installed in accordance with the Drawings, Specifications, and the manufacturer's recommendations and that the equipment is ready for start-up and functional testing to be performed.

## 1.05 FUNCTIONAL TEST

- A. Following the installation inspection by factory representative, perform a functional test on each piece of equipment. The functional test shall consist of operation of the equipment on a normal duty cycle for a sufficient period of time to determine satisfactory operation. Time required for functional testing shall be as specified in the equipment specifications or a minimum one continuous eight-hour period, whichever is longer. To the maximum extent practical, exercise the full capabilities of all equipment including remote operation, instrumented control schemes, alternate modes of operation and emergency operation. Equipment shall be checked for any abnormal noise or vibration as part of the functional test, and any observed abnormal conditions corrected prior to certification.
- B. Should the results of the functional test indicate that the equipment has failed to perform in accordance with the Specifications, the Contractor shall make, at no additional cost to the Owner, all modifications or adjustments as required for satisfactory operation, including replacement of any or all components, if necessary. Following the modifications or adjustments, the Contractor shall repeat the functional test. This procedure shall be repeated until the results of the test indicate that the equipment has satisfied the requirements of the applicable Specification Section.
- C. After the functional test is completed, each manufacturer shall certify, in writing, that tests were made in accordance with the Specifications and the manufacturer's recommendations, that the functional tests and start-up operation have been satisfactory and that the equipment is fully operational and capable of meeting operating requirements.

## 1.06 OPERATING TEST PERIOD

- A. Following the functional test, the Contractor shall place each system into service and undergo an operational test under normal service conditions. The minimum time for

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the operating test period for each system shall be 30 consecutive days, excluding time that the equipment is taken out of service.

- B. Where required in the equipment specifications, process performance testing shall be performed during the operating test period in accordance with the requirements of the equipment specifications. The Contractor shall provide all materials and labor, including the services of a factory representative, necessary to perform the performance testing.
- C. The test period shall commence upon the initiation of operation of all systems and shall end after the successful operation of the equipment for the minimum time required.
- D. The Contractor shall repair and make all modifications required due to mechanical failure of the equipment during the operating test period. Should the equipment fail to meet the performance testing requirements, a factory representative shall evaluate the equipment and determine the cause of the process failure. The Contractor shall make all modifications recommended by the manufacturer.

## 1.07 CERTIFICATION

- A. Upon completion of start up, the Contractor shall provide written Installation and Start-Up Report from all equipment manufacturers' factory representatives. Report shall address the equipment installation's compliance with manufacturer's requirements and note any problems noted that may affect the warranty, operation or longevity of the equipment. Written certification shall indicate that tests were made in accordance with the manufacturer's recommendations, that the test and start-up operation has been satisfactory completed and that the equipment is fully operational under design requirements. Written certification shall be filed with the Engineer on the manufacturers stationary.

*(Manufacturer's Installation and Start-up Report Follows)*

## Manufacturer's Installation and Start-up Report

<b><u>GENERAL INFORMATION:</u></b>			
Owner: _____		Contractor: _____	
Facility: _____		System: _____	
Location: _____		Specification Number: _____	
Tag: _____			
<b><u>MANUFACTURER:</u></b>			
Manufacturer Name: _____			
Address: _____			
City/State/Zip: _____			
Phone Number: _____		Fax Number: _____	
E-Mail: _____			
Manufacturer's Representative: _____			

- |                                                                                |                            |                            |                              |
|--------------------------------------------------------------------------------|----------------------------|----------------------------|------------------------------|
| 1. Required safety equipment available?                                        | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 2. Are equipment tags correct and attached to equipment?                       | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 3. Are rotating equipment safety guards in place and secure?                   | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 4. Shaft and couplings aligned?                                                | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 5. Have belt drives been aligned?                                              | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 6. Bearings lubricated?                                                        | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 7. Oil reservoirs filled with proper lubricant?                                | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 8. Rotation verified?                                                          | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 9. Is equipment level?                                                         | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 10. Equipment anchored properly?                                               | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 11. Equipment grouted properly?                                                | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 12. Required utilities available?                                              | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 13. Nozzles free from loads?                                                   | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 14. Are required pressure and temperature gauges and sensors installed?        | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 15. Have any shipping coatings/sealants been removed?                          | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 16. Does any paint/coating damage need to be repaired?                         | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 17. Have moving parts been checked for proper running clearance?               | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 18. Is there any observed leakage of lubricants or fluids from equipment?      | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 19. Are all electrical power connections made and properly torqued?            | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 20. Are electrical overloads properly set?                                     | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 21. Are current transformers properly wired for polarity?                      | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |
| 22. Are control enclosures per the specified NEMA classification and material? | Y <input type="checkbox"/> | N <input type="checkbox"/> | N/A <input type="checkbox"/> |

Starting of Systems

- 23. Are instrumentation connections terminated? Y  N  N/A
- 24. Are signal cable shield leads grounded in accordance with Manufacturer's recommendations? Y  N  N/A
- 25. Are required spare parts on-site, inventoried and properly stored? Y  N  N/A
- 26. Are Operations and Maintenance Manuals on-site and complete? Y  N  N/A
- 27. Are all installation requirements of the O&M Manuals performed? Y  N  N/A
- 28. Does equipment have a record of maintenance and exercise as recommended by the manufacturer during storage? Y  N  N/A
- 29. Are there any observed installation issues that impact the equipment warranty? Y  N  N/A

Additional items noted during installation inspection by Manufacturer's Start-up Representative:

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I certify as an authorized Factory Representative, that the equipment is installed in accordance with the Manufacturer's recommendations, and is ready for start-up and initial operation.

Factory Representative: \_\_\_\_\_  
 Representing: \_\_\_\_\_  
 Mailing Address: \_\_\_\_\_  
 \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 E-mail Address: \_\_\_\_\_

Date: \_\_\_\_\_  
 (If employed by other than the Manufacturer)

**START-UP REPORT:**

- 1. Does equipment operate and perform in accordance with the specification? Y  N  N/A
- 2. Have all specified modes of operation been tested and verified? Y  N  N/A
- 3. Do all system indicators, readouts, controls and operator interfaces operate? Y  N  N/A
- 4. Have variable speed units been tested throughout the available speed range? Y  N  N/A
- 5. Have multi-speed motors been tested on all available speeds? Y  N  N/A
- 6. Did equipment exhibit any abnormal vibration during operation? Y  N  N/A
- 7. Did equipment exhibit any abnormal noise during operation? Y  N  N/A
- 8. Are bearings operating at normal temperature? Y  N  N/A
- 9. Do bearings display any roughness in operation? Y  N  N/A
- 10. Prior to start-up, or during initial operation, was any leakage of lubricant observed? Y  N  N/A
- 11. Was any leakage of process fluids observed during start-up? Y  N  N/A
- 12. Has operation of equipment protective systems been verified? Y  N  N/A
- 13. Is the equipment ready to place into operation? Y  N  N/A

Additional items noted during start-up by Manufacturer's Start-up Representative:

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I certify as an authorized Factory Representative, that the equipment has been properly started up in accordance with the Manufacturer's recommendations, and is ready for initial operation.

Factory Representative: \_\_\_\_\_ Date: \_\_\_\_\_

END OF SECTION



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## PART 1 GENERAL

### 1.01 SCOPE

- A. The Contractor shall provide five copies of a complete and comprehensive reference manual (Operating and Maintenance Manual) containing operating and maintenance data to enable operators and plant engineers to correctly operate, service and maintain all equipment and accessories covered by the Specifications and Drawings. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance procedures, calibration procedures and safety precautions and procedures for the equipment involved.
- B. No separate payment will be made for the Operating and Maintenance Manual and the cost of said manual shall be included in the Contract Price.

### 1.02 SUBMITTAL SCHEDULE

- A. The Contractor shall submit, for the Engineer's approval, three preliminary drafts of proposed formats and outlines of contents of manuals within 60 calendar days after the Notice to Proceed. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return one copy of the manual for completion and/or correction.
- B. Submit three preliminary copies of manuals before the work covered by the Contract Documents is 40 percent complete. The Contractor must also submit three copies of the manual in digital format as specified below. The Engineer will notify the Contractor, in writing, of any deficiencies in the manual and will return one copy of the manual for completion and/or correction.
- C. Resubmissions: Clearly identify each correction or change made. The resubmission shall be accompanied by a letter listing all comments made by the Engineer and the actions or response by the manufacturer or vendor to each comment. Where the Engineers comment applies to multiple areas of the initial submittal the response shall address all areas. The response letter shall also address where supplemental information has been provided and where it is located within the resubmission.
- D. Before the work covered by the Contract Documents is 70 percent complete, the Contractor must submit six final copies of the revised and completed manual, complete in detail as specified below. The Contractor must also submit five copies of the manual in digital format as specified below.
- E. Digital Copies of Manuals: Operations and Maintenance Manuals shall be provided by the Contractor in digital format concurrently with both the preliminary and final hard copy submissions. Materials available in digital format shall be furnished in accordance with the following:
  - 1. All textual data shall be provided as an electronic file in searchable Adobe Acrobat Portable Document Format (PDF). The PDF file(s) shall be fully indexed using the

Table of Contents, searchable with thumbnails generated. File(s) shall be identified by utilization of a "twelve dot three" convention (XXXXXX.XX.YY.pdf) where X is the eight digit number corresponding to the specification section, and YY is an identification number. All documents shall be scanned at 300dpi or greater utilizing optical character recognition (OCR) software. All text in the document must be text selectable with the exception of pages which are in their entirety drawings or diagrams. Word searches of the PDF document must function successfully. PDF files that fail to comply with the indexing and searchable features described above will not be acceptable. All drawing data shall be provided in digital format compatible with AutoCAD Version as designated by the Engineer.

2. Materials not available in original digital format (available only in paper format) shall be scanned as noted above into a PDF format and cleaned to remove smudges, fingerprints, artifacts, and other extraneous marks. All notes, version stamps, etc. shall be preserved. Color maps shall be scanned in not less than the number of colors of the document or 16 colors, whichever is greater. Color photographs shall be saved in not less than 256 colors. Black and white or monochrome scans (non-text) shall not be less than 16 gray scale levels. Color maps, color photographs, and black and white and gray scale photograph files shall be saved as GIF or JPG files, compatible with Adobe Photoshop Version 4.0. Documents shall be scanned in the existing color format of the document, i.e. color documents shall be scanned in color, and black and white or monochrome in gray scale.
3. After the documents are in correct digital format, they shall be furnished to the Engineer as a 120 mm, 680mb, 74-minute CD ROM. All media transmittals shall be accompanied by a detailed paper printout of the files on the media. This printout shall consist of a file name, file size, date of creation, submittal number, and a brief but accurate description of the file. Files shall not be transmitted electronically. Five copies of the CD for each Operation and Maintenance Manual shall be provided to the Engineer.
4. Electronic copy of O&M manuals shall be attached to the corresponding entry in Primavera Contract Manager.

### 1.03 SUBMITTAL FORMAT

- A. Each hard copy of the manual shall be assembled in one or more loose leaf binders, each with title page, typed table of contents, typed list of tables, typed list of figures, and heavy section dividers with reinforced holes and numbered plastic index tabs. Binders shall be uniform for all manuals and shall be 3-ring, hardback type, with transparent vinyl pocket front cover suitable for inserting identifying cover and with a transparent vinyl pocket on the spine for label. All data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the project title, specification section number and title, and manual title printed thereon, all as approved by the Engineer.
- B. All copies of shop drawings, figures and diagrams shall be reduced to either 8-1/2 x 11-inches or to 11-inches in the vertical dimension and as near as practical to

17-inches in the horizontal dimensions. Such sheets shall be folded to 8-1/2 x 11-inches. The manual and other data shall be printed on first quality paper, 8-1/2 x 11-inch size with standard 3-hole punching. Binders shall be labeled Vol. 1 of "X", Vol. 2 of "X", etc., where "X" is the total number of volumes in the set where more than one is required. The table of contents for the entire set, identified by volume number, shall appear in each binder. Text, figures and drawings shall be clearly legible and suitable for dry process reproductions.

- C. Each submittal shall have a cover sheet that includes the following information:
1. The date of submittal and the dates of any previous submittals.
  2. The Project title.
  3. Submittal numbering shall be in accordance with Section 01 31 29 of these Specifications.
  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.
- D. The Engineer will not recommend final acceptance of the Work until the Operating and Maintenance Manual is complete and satisfactory to Engineer.

#### 1.04 CONTENTS OF OPERATING AND MAINTENANCE MANUAL

- A. Each manual shall include a title page which includes all information specified in Article 1.03, paragraph C of this Section. In addition, the title page shall include manufacturer's address, phone number, facsimile number, and contact; manufacturer's equipment name and model number; supplier's address, phone number, facsimile number, and contact.
- B. Each manual shall include a table of contents identifying the location of each item listed below, for each component supplied. For items not applicable to a component, the table of contents shall list N/A for the page number.
- C. For all equipment, the Contractor shall furnish a complete, detailed listing of all equipment, components and accessories showing component name, manufacturer, model number and quantity information shall be furnished for each component as outlined below:
1. A summary page shall be provided for each piece of equipment detailing the following information:
    - a. Equipment Number
    - b. Equipment Description
    - c. Serial Number
    - d. Model Number

- e. Manufacturer
    - 1) Address
    - 2) Phone
    - 3) Representative
  - f. Supplier
    - 1) Address
    - 2) Phone
    - 3) Representative
  - g. Local Service Provider
    - 1) Address
    - 2) Phone
    - 3) Representative
  - h. Location of Equipment
  - i. Equipment Design Criteria
    - 1) HP
    - 2) Flow Rate, etc.
  - j. Performance Data
  - k. Normal Operating Characteristics
  - l. Limiting Conditions
2. Detailed disassembly, overhaul and reassembly, installation, alignment, adjustment and checking instructions.
  3. Detailed operating instructions for start-up, calibration, routine and normal operation, regulation and control, safety, shutdown and emergency conditions. Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, rupture discs, etc.
  4. Detailed preventative maintenance procedures and schedules, including detailed lubrication instructions and schedules, identification of required lubricants and operating fluids (description, specification and trade name of at least two manufacturers), and diagrams illustrating lubrication points.
  5. Detailed guide to equipment and/or process "troubleshooting".
  6. Detailed parts lists identified by title, materials of construction, manufacturer's part number, list of recommended spare parts identified as specified above, current cost list for recommended spare parts, predicted life of parts subject to wear, and an exploded or concise cut-away view of each equipment assembly. The manufacturer's part numbers must match those used for the spare parts, documentation, identification, and turn-over. Should no spare parts be required, state in the Table of Contents that "No spare parts are required".
  7. Electrical and instrumentation schematics, including motor control centers, control panels, wiring diagrams, instrument panels and analyzer panels. All panels must have as-built schematics inside them at contract close-out.
  8. List of all special tools supplied and description of their use. Special tools include any tool not normally available in an industrial hardware or mill supply house. Should no special tools be required, state in the Table of Contents that "No special tools are required".

9. List of names and addresses of nearest service centers for parts, overhaul and service.
10. Procedures for storing, handling and disposing of any chemicals or products used with the equipment or system.
11. For equipment and systems, also provide the following:
  - a. Control and wiring diagrams provided by the controls manufacturer.
  - b. Sequence of operations by the controls manufacturer.
  - c. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
12. The supplier's operation and maintenance information will address the particular equipment furnished, with specific details on operation and maintenance practices. General data is not acceptable. Information contained in the manual which is not appropriate to the Project shall be marked out and noted as "N/A".

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION (NOT USED)

**SAMPLE COVER PAGE**

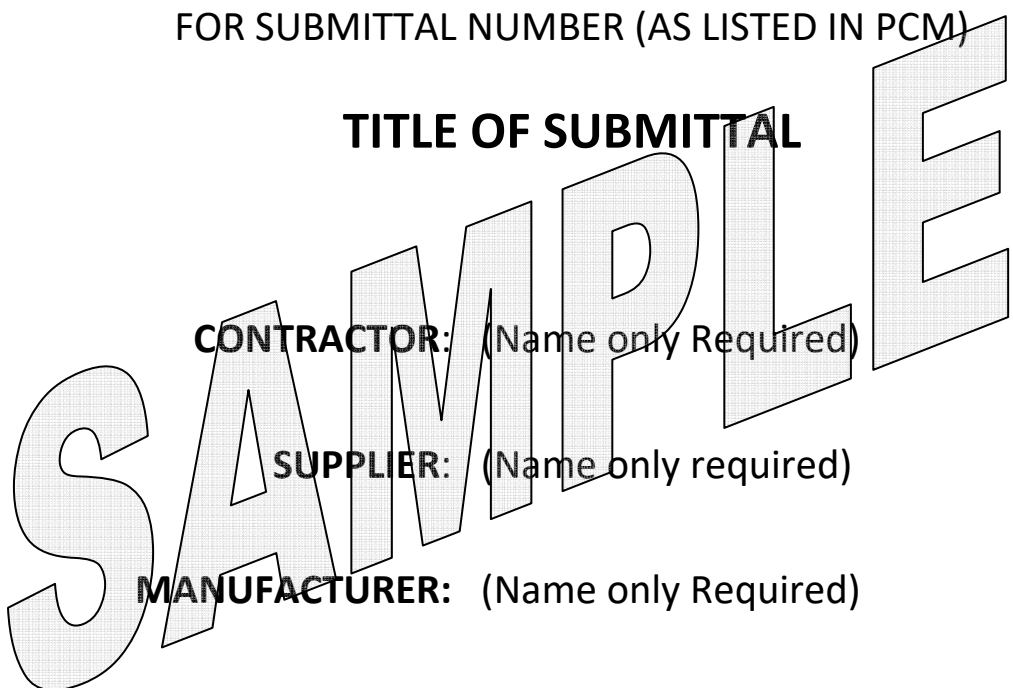
**COMPLETE PROJECT TITLE**

LOCATION OF PROJECT

**OPERATING and MAINTENANCE DATA**

FOR SUBMITTAL NUMBER (AS LISTED IN PCM)

**TITLE OF SUBMITTAL**



**CONTRACTOR:** (Name only Required)

**SUPPLIER:** (Name only required)

**MANUFACTURER:** (Name only Required)

**SPECIFICATION SECTION:**

**EQUIPMENT TAG NUMBER:**

**DRAWING NUMBER:**

**DATE OF SUBMISSION**

**SAMPLE TITLE PAGE**

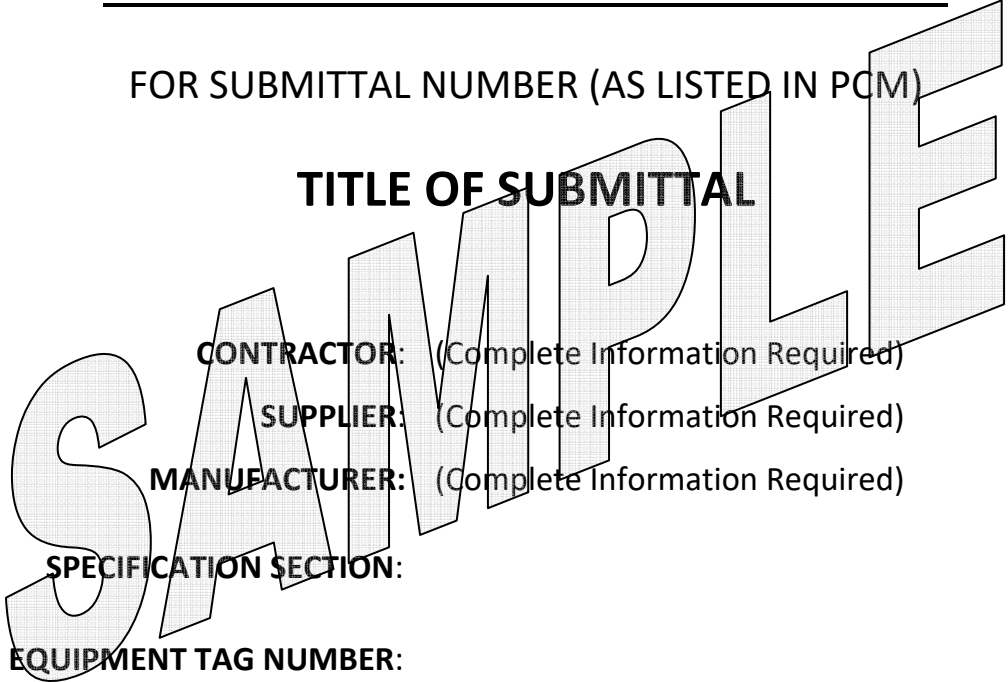
**COMPLETE PROJECT TITLE**

LOCATION OF PROJECT

**OPERATING and MAINTENANCE DATA**

FOR SUBMITTAL NUMBER (AS LISTED IN PCM)

**TITLE OF SUBMITTAL**



**CONTRACTOR:** (Complete Information Required)

**SUPPLIER:** (Complete Information Required)

**MANUFACTURER:** (Complete Information Required)

**SPECIFICATION SECTION:**

**EQUIPMENT TAG NUMBER:**

**DRAWING NUMBER:**

**DATE OF SUBMISSION**

**SAMPLE MANUAL REVIEW CHECK LIST****FINAL COPIES / PRELIMINARY COPIES  
OPERATION AND MAINTENANCE MANUAL CHECK LIST****PROJECT NUMBER:****PROJECT NAME:****SECTION:****SECTION Requirements**

- 1.03 - A \_\_\_ 3 ring loose leaf binder with transparent covers on binder and cover
- 1.03 - A \_\_\_ Title Page, Table of Contents, Section dividers and List of tables & figures
- 1.03 - B \_\_\_ Drawings and figures shall be legible and 11" in the vertical dimension
- 1.03 - C \_\_\_ Cover Page including: Date of Submittal & any previous submissions, Project & Manual Title, Names of Contractor, Supplier, Manufacturer, Spec. Section, Equip. Tag Number & Drawing No
- 1.04 - A \_\_\_ Title Page: All cover page information & manufacturers and suppliers address, phone & fax number and contact person; manufacturer's equipment name and model number
- 1.04 - B \_\_\_ Table of Contents identifying the location of each item listed
- 1.04 - C.1 \_\_\_ Provide equipment function, operating char., performance data, limiting cond. and pump curves
- 1.04 - C.2 \_\_\_ Detailed: disassembly, overhaul, reassemble, installation, alignment, adjusting & checking Instructions
- 1.04 - C.3 \_\_\_ Operating instructions for start up, calibration, normal operation, shutdown, etc.
- 1.04 - C.3 \_\_\_ List of settings for relays, pressure switch, temperature switch, level switch and alarms
- 1.04 - C.4 \_\_\_ Preventive maintenance procedures and diagrams illustrating lubrication points
- 1.04 - C.5 \_\_\_ Troubleshooting Guide
- 1.04 - C.6 \_\_\_ Detailed parts list, manufacturer's part number and exploded view
- 1.04 - C.6 \_\_\_ List of recommended spare parts and predicted life of parts subject to wear
- 1.04 - C.7 \_\_\_ Electrical and instrumentation schematics
- 1.04 - C.8 \_\_\_ Special tools list
- 1.04 - C.9 \_\_\_ Closest service centers, Contact person name and addresses
- 1.04 - C.10 \_\_\_ Procedure for storing, handling and disposing of any chemicals used
- 1.04 - C.11 \_\_\_ Equip & Systems provide Control & Wiring Diag., Sequence of Operations, Charts of tag numbers, location & function of each valve
- 1.04 - C.12 \_\_\_ Suppliers O&M information will address the particular equipment furnished, with specific details on operation and maintenance practices

**Remarks:**



END OF SECTION

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## PART 1 GENERAL

### 1.01 PROJECT MAINTENANCE AND WARRANTY

- A. Maintain and keep in good repair the work covered by these Drawings and Specifications until acceptance by the Owner.
- B. Specific requirements for warranties for the work and products and installations that are specified to be warranted are included in the individual Sections of these specifications. Refer to individual Sections for specific content requirements.
- C. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the work, or a designated portion of the work, submit written warranties upon request of the Owner.
- D. At Final Completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- E. Where required, the Contractor shall supply evidence, satisfactory to the Engineer, that the Contractor can obtain manufacturers' certifications as to the Contractor's installation of equipment.
- F. 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.
- G. 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.
- H. 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.

- I. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.
- J. 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.
- K. 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.
- L. 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.
- M. 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.
- N. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE

- A. The work under this Section includes, but is not necessarily limited to, the compiling, maintaining, recording and submitting of Project record documents as herein specified.
- B. Record documents include, but are not limited to:
  - 1. Drawings;
  - 2. Specifications;
  - 3. Change orders and other modifications to the Contract;
  - 4. 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.

### 1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

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

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

### 1.03 QUALITY ASSURANCE

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

### 1.04 RECORDING

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

### 1.05 RECORD DRAWINGS

- A. Record Drawings shall be reproducible, shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.
- B. Legibly mark drawings to record actual construction, including:
  - 1. All Construction
    - a. Changes of dimension and detail.
    - b. Changes made by 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.

## 1.06 SPECIFICATIONS

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

## 1.07 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

END OF SECTION

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## PART 1 GENERAL

### 1.01 DESCRIPTION

#### A. Scope:

1. Provide all labor, materials, equipment, and incidentals as shown, specified and required for demolition, removal, and disposal Work.
2. The Work under this Section includes, but is not necessarily limited to:
  - a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of structural concrete, piping, manholes, electrical and mechanical systems and equipment, paving, curbs, sidewalks, gutters, and similar existing facilities.
  - b. Demolition and removal of all Underground Facilities underneath, and above-grade piping and utilities in, the building(s) and structures shown or indicated for demolition, unless the Underground Facilities or above-grade facilities are shown or indicated as to remain.
  - c. Remove from slabs, foundations, walls, and footings that are to be demolished all utilities and appurtenances embedded in such construction.
3. Demolitions and removals specified under other Sections shall comply with requirements of this Section.
4. Perform demolition Work within areas shown or indicated.
5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition.

#### B. Coordination:

1. Comply with Section 01 14 16, Coordination with Owner's Operations.
2. Review procedures under this and other Sections and coordinate the Work that will be performed with or before demolition and removals.
3. Comply with Section 31 75 01 for deep excavations manholes and structures. Submit detailed plans and shoring details to support earth lateral loads, groundwater pressures and surcharges listed on Engineer's Report Section 4.5.3.5.4. Documentation to be signed and sealed by a TN licensed engineer.

#### C. Related Sections:

1. Section 31 11 00, Clearing and Grubbing.

### 1.02 QUALITY ASSURANCE

#### A. Qualifications:

1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.

B. Regulatory Requirements:

1. Demolition, removal, and disposal Work shall be in accordance with all applicable Laws and Regulations.
2. Comply with requirements of authorities having jurisdiction.

### 1.03 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Procedure Submittals:
  - a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:
    - 1) Plan for coordinating shut offs, capping, temporary services, and continuing utility services.
    - 2) Other proposed procedures as applicable.
    - 3) Planned demolition operating sequences.
2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Section.
3. Qualifications Statements:
  - a. Name and qualifications of entity performing electrical removals, including copy of licenses required by authorities having jurisdiction.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Notification:

1. At least 48 hours prior to commencing demolition or removal, notify ENGINEER in writing of planned start of demolition Work. Do not start removals without permission of ENGINEER.

- B. Protection of Surrounding Areas and Facilities:
1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.
  2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
  3. Provide temporary barriers, lighting, sidewalk sheds, and other necessary protection.
  4. Repair damage to facilities that are to remain.
- C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, do the following:
1. Should uncharted or incorrectly charted Underground Facilities be encountered, CONTRACTOR responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.
  2. Storm Water: Existing storm water system shall remain in place until demolitions of existing building or structure is completed. Upon completing demolition, cut and cap storm sewer laterals at locations shown on the Drawings. Remove existing storm water piping and related structures between points of cutting, and backfill, restore to grade, and stabilize the area over the removed facilities.
  3. Shutdown of utility services shall be coordinated by CONTRACTOR, assisted by OWNER as required relative to contacting utility owners.

### 3.02 DEMOLITION - GENERAL

- A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.
- B. Pollution Controls:
1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05, Temporary Controls, and Laws and Regulations.
  2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
  3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions and Section 01 74 05 Cleaning.

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- C. Explosives:
1. Do not bring explosives to the Site or use explosives.
- D. Comply with Section 01 73 29, Cutting and Patching.
- E. Building or Structure Demolition:
1. Unless otherwise approved by ENGINEER, proceed with demolition from top of building or structure to the ground. Complete demolition Work above each floor or tier before disturbing supporting members of lower levels.
  2. Demolish concrete and masonry in small sections.
  3. Remove structural framing members and lower to ground using hoists, cranes, or other suitable methods. Do not throw or drop to the ground.
  4. Break up and remove foundations and slabs-on-grade unless otherwise shown or indicated as remaining in place.
- F. Demolition of Site Improvements:
1. Pavement, Sidewalks, Curbs, and Gutters: Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
  2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.
  3. Manholes, Vaults, Chambers, and Handholes: Remove to the limits shown or indicated on the Drawings.
  4. Underground Facilities Other than Manholes, Vaults, Chambers, and Handholes: Remove to the extent shown or indicated on the Drawings. Unless otherwise shown or indicated, cap ends of piping to remain in place in accordance with the "Mechanical Removals" Article in this Section.
  5. Landscaping: Comply with Section 31 11 00, Clearing and Grubbing.
- G. Salvage and Ownership:
1. Refer to Section 01 11 13, Summary of Work, for requirements on salvage, ownership, and handling of equipment and materials removed during demolition and removal Work.
  2. Materials and equipment to remain OWNER's property shall be carefully removed and appropriately handled by CONTRACTOR to avoid damage and invalidation of warranties in effect and shall be cleaned and stored at the Site (or other site specified in the Contract Documents) at place designated by ENGINEER or OWNER.

### 3.03 STRUCTURAL REMOVALS

#### A. Recycling and Reuse of Demolition Materials:

1. All concrete, brick, tile, masonry, roofing materials, reinforcing steel, structural metals, miscellaneous metals, plaster, wire mesh, and other items contained in or upon building or structure to be demolished shall be removed, transported, and disposed of away from the Site, unless otherwise approved by ENGINEER.
2. Do not use demolished materials as fill or backfill adjacent to structures, in pipeline trenches, or as subbase under structures or pavement.

### 3.04 MECHANICAL REMOVALS

A. Mechanical demolition and removal Work includes dismantling and removing existing piping, tanks, and appurtenances as shown, indicated, and required for completion of the Work. Mechanical removals include cutting and capping as required, except that cutting of existing piping and ductwork to make connections is included under Section 01 12 16, Construction Sequence; Section 01 73 29, Cutting and Patching; and applicable Sections of Division 33, Utilities.

#### B. Demolition and Removals of Piping, Ductwork, and Similar Items:

1. Purge piping and tanks (as applicable) of chemicals, fuel, water or wastewater (as applicable) and make safe for removal and capping. Existing piping to remain in place shall remain active during abandonment unless otherwise directed by the Engineer. Remove to the extent shown or indicated existing process, water, waste and vent, chemical, gas, fuel, and other piping. Remove piping to the nearest solid piping support and provide caps on ends of remaining piping. Where piping to be demolished passes through existing walls to remain, cut off and cap pipe on each side of the wall.
2. Caps, Closures, Blind Flanges, and Plugs:
  - a. Provide closure pieces, such as blind flanges and caps, where shown or required to complete the Work.
  - b. Where used in this Section, the term "cap" means the appropriate type closure for the piping or ductwork being closed, including caps, blind flanges, and other closures.
  - c. Caps shall be compatible with the piping or ductwork to which the cap is attached, fluid-tight and gastight, and appropriate for the fluid or gas conveyed in the pipe or duct.
  - d. Unless otherwise shown or indicated, caps shall be mechanically fastened, fused, or welded to pipe or duct. Plug piping with means other than specified in this Section only when so shown or indicated in the Contractor Documents or when allowed by ENGINEER.
3. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.

4. Remove waste and vent piping, and ductwork to extent shown and cap as required. Where demolished vent piping, stacks, and ductwork passes through existing roofing, patch the roof with the same or similar materials. Completed patch shall be watertight and comply with roofing manufacturer's recommendations.
5. Modifications to potable water piping and other plumbing and heating system work shall comply with Laws and Regulations. All portions of potable water system that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing piping and heating piping.

### 3.05 ELECTRICAL REMOVALS

- A. Electrical demolition Work includes removing existing conduit and raceways, cabling, poles and overhead cabling, and miscellaneous electrical equipment, as shown, specified, or required.
- B. Remove existing electrical equipment and fixtures to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.
- C. Cables in conduits to be removed shall be removed back to the power source or control panel, unless otherwise shown or indicated. Verify the function of each cable before disconnecting and removing.
- D. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.
- E. Where shown or indicated, remove direct burial cable. Openings in buildings for entrance of direct burial cable shall be patched with repair mortar or other material approved by ENGINEER for this purpose and made watertight.
- F. Existing poles and overhead cables shall be removed or abandoned as shown and specified. Existing substation(s) and poles owned by electric utility will be removed by the electric utility. Completely remove from the Site poles not owned by electric utility and shown or indicated for removal. Make necessary arrangements with electric utility for removal of utility company's transformers and metering equipment after new electrical system has been installed and energized.

### 3.06 DISPOSAL OF DEMOLITION DEBRIS

- A. Remove from the Site all debris, waste, rubbish, and material resulting from demolition operations and equipment used in demolition Work. Comply with the General Conditions, Supplementary Conditions, and Section 01 74 00, Cleaning and Waste Management.
- B. Unless otherwise directed by OWNER or ENGINEER, all materials removed under this section shall be removed from the site and disposed of at the CONTRACTOR'S

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expense. Point of disposal shall be subject to approval of the OWNER and the local jurisdiction responsible for the issuance of dumping permits.

C. Transportation and Disposal:

1. Non-hazardous Material: Properly transport and dispose of non-hazardous demolition debris to a permitted landfill or other suitable location permitted by the Division of Solid Waste Management, in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.
2. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with the Contract Documents and Laws and Regulations.

- D. Submit to ENGINEER information required in this Section on proposed facility(ies) where demolition material will be recycled. Upon request, ENGINEER or OWNER, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance status. During such visits, recycling facility operator shall cooperate and assist ENGINEER and OWNER.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and install cast-in-place concrete complete as shown on the Drawings and as specified herein.
- B. Furnish, as required to establish concrete mixes, all sampling and laboratory testing of products and materials performed by an independent testing laboratory engaged by and at the expense of the Contractor.

### 1.02 RELATED WORK

- A. Watertightness test for water containing structures is included in Section 01 45 25.
- B. Concrete formwork is included in Section 03 10 00.
- C. Concrete reinforcement is included in Section 03 20 00.
- D. Concrete joints and joint accessories are included in Section 03 15 00.
- E. Concrete finishes are included in Section 03 35 00.
- F. Grout is included in Section 03 60 00.
- G. Unit Masonry is included in Section 04 20 00.
- H. Miscellaneous metals are included in Section 05 50 00.
- I. Waterproofing, dampproofing, and caulking are included in Section 07 11 13.

### 1.03 SUBMITTALS

- A. Submit, in accordance with Section 01 33 23, product data for:
  - 1. Sources of cement, fly ash or ground granulated blast furnace slag, aggregates, and batched concrete. Indicate name and address of mill or quarry, as applicable.
  - 2. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
  - 3. Water reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
  - 4. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.

5. Safety Data Sheets (SDS) for all concrete components and admixtures.
6. Cold weather and hot weather concreting plans demonstrating how concrete will meet the requirements of this Section including but not limited to concrete mixes, placement, curing and protection.
7. High-range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.
8. Liquid membrane forming curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM standards. Identify proposed locations of use.

#### B. Test Reports

1. Aggregates: Conformance to ASTM standards, including sieve analysis, mechanical properties, deleterious substance content, and mortar bar expansion test results.
2. Cement and fly ash or ground granulated blast furnace slag: Conformance to ASTM standards, including chemical analysis and physical tests.
3. Concrete mixes: For each formulation of concrete proposed for use, submit constituent quantities per cubic yard, water cementitious ratio, air content, concrete slump, type and manufacturer of cement and type and manufacturer of fly ash or ground granulated blast furnace slag. Provide either Paragraph a. or b., below, for each mix proposed.
  - a. Standard deviation data for each proposed concrete mix based on statistical records.
  - b. Provide the following for each strength data point used in the calculation of the standard deviation for determination of the minimum required average strength:
    - 1) Date of sampling and name of testing laboratory.
    - 2) Name of concrete batch plant.
    - 3) Water cementitious ratio.
    - 4) Slump of batch.
    - 5) Air content of batch.
    - 6) Compressive strengths of all cylinders tested at that age in that batch.
    - 7) If available, temperature and unit weight of batch.
    - 8) Provide data from projects not more strictly controlled than outlined in these specifications. Provide summary sheet showing all pertinent data and the computation of the standard deviation.
  - c. Water cementitious ratio curve for concrete mixes based on laboratory tests. Provide average cylinder strength test results at 7, 14, and 28 days for laboratory concrete mix designs.
4. Concrete Mixes: shrinkage.

#### C. Certifications

1. Certify that admixtures used in the same concrete mix are compatible with each other and the aggregates.
2. Certify that the Contractor is not associated with the independent testing laboratory proposed for use by the Contractor nor does the Contractor or officers of the Contractor's organization have a beneficial interest in the laboratory.
3. Certificate of conformance for concrete production facilities from the NRMCA.

## 1.04 REFERENCE

### A. ASTM International

1. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
6. ASTM C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
8. ASTM C150 - Standard Specification for Portland Cement
9. ASTM C156 - Standard Test Method for Water Retention by Liquid Membrane-Forming Curing Compound for Concrete
10. ASTM C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
11. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
12. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
14. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
15. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.

16. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  17. ASTM C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for use in Portland Cement Concrete.
  18. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
  19. ASTM C596 - Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
  20. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
  21. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
  22. ASTM C1017 - Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete.
  23. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
  24. ASTM C1260 - Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).
  25. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
- B. American Concrete Institute (ACI).
1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
  2. ACI 232.2R - Use of Fly Ash in Concrete.
  3. ACI 233R - Slag Cement in Concrete and Mortar.
  4. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete.
  5. ACI 304.2R - Placing Concrete by Pumping Methods.
  6. ACI 305R - Hot Weather Concreting.
  7. ACI 306R - Cold Weather Concreting.
  8. ACI 350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary.
- C. National Ready Mixed Concrete Association (NRMCA)

1. Quality Control Manual, Section 3 - Certification of Ready Mixed Concrete Production Facilities.
- D. Truck Mixer Manufacturers Bureau (TMMB)
1. TMMB 100 - Truck Mixer, Agitator and Front Discharge Concrete Carrier Standards.
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 QUALITY ASSURANCE

- A. Comply with ACI 318 and 350 and other stated specifications, codes and standards. Apply the most stringent requirements of other stated specifications, codes, standards, and this Section when conflicts exist.
- B. Use only one source of cement and aggregates for the project. Provide concrete uniform in color and appearance.
- C. At least ten working days before the first concrete placement hold a preconstruction meeting to review the requirements for concrete placement, waterstop placement, jointing, concrete curing, hot weather concreting, cold weather concreting and finishing. Review, with the attendance of the plasticizer manufacturer, the properties and techniques of batching and placing concrete containing high-range water-reducing admixture. Notify all parties involved, including the Engineer, of the meeting at least ten working days prior to its scheduled date. Prepare an agenda for the meeting. Take meeting minutes and distribute to all attendees.
- D. If, during the progress of the work, it is impossible to secure concrete of the specified workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the specified properties. Make all changes so ordered at no additional cost to the Owner.
- E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, make, at no additional cost to the Owner, new acceptance tests of materials and establish new concrete mixes with the assistance of an independent testing laboratory.
- F. Provide all field testing and inspection services and related laboratory tests. Methods of testing shall comply with the latest applicable ASTM methods. The following items shall be tested to verify conformity with this Section.
1. Concrete placements - compressive strength (cylinders), compressive strength (cores), temperature, slump, and air content.
  2. Other materials that may require field testing.
- G. Provide laboratory tests of samples of constituents and of concrete as-placed. All materials incorporated in the work shall conform to accepted samples.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Cement: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination and to prevent warehouse set.
- B. Aggregate: Arrange and use stockpiles to prevent segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding three feet in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
- C. Sand: Arrange and use stockpiles to prevent contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen sand.
- D. Admixtures: Store in closed containers to prevent contamination, evaporation or damage. Provide agitating equipment to uniformly disperse ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
- E. Fly Ash or Ground Granulated Blast Furnace Slag: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination.
- F. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
- G. Liquid Membrane Forming Curing Compounds: Store in closed containers.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

### 2.02 MATERIALS

- A. Materials shall comply with this Section and any applicable State or local requirements.
- B. Cement: Domestic portland cement conforming to ASTM C150. Cement shall be low alkali cement. Do not use air entraining cements. Cement brand must be approved by the Engineer and one brand shall be used throughout the work. Provide the following type(s) of cement:
  - 1. Class A Concrete - Type I with the addition of fly ash or ground granulated blast furnace slag resulting in C3A being below 8 percent of total cementitious content, Type II, Type II (MH) or Type III limited to 8 percent C3A.

2. Class E1, E2 Concrete - Type II, Type II (MH) with the addition of fly ash or ground granulated blast furnace slag resulting in C3A being below 5 percent of total cementitious content, Type III limited to 5 percent C3A or Type V.
- C. Aggregates:
1. Fine Aggregate: Washed inert natural sand conforming to ASTM C33.
  2. Coarse Aggregate: Well-graded crushed stone or washed gravel conforming to ASTM C33. Grading requirements as listed in ASTM C33, Table 3 for the specified coarse aggregate size number listed in Table 1 herein. Limits of deleterious substances and physical property requirements as listed in ASTM C33, Table 4 for severe weathering regions. Do not use coarse aggregates known to be deleteriously reactive with alkalis in cement.
  3. The fine and coarse aggregates used shall not cause expansion of mortar bars greater than 0.1 percent in 16 days when tested in accordance with ASTM C1260 and using the cement proposed for the project. If aggregates proposed for use do not meet this requirement, then satisfy either a. or b. below.
    - a. Total equivalent alkali content of the cement used shall not exceed 0.60 percent as provided in the Optional Chemical Requirements of ASTM C150.
    - b. The fine and coarse aggregates used shall not cause expansion of mortar bars greater than 0.1 percent in 16 days when tested in accordance with ASTM C1260 and using the cement and fly ash or ground granulated blast furnace slag proposed for the project. The proportions of the cement-fly ash mix or cement-ground granulated blast furnace slag mix shall be the same as those proposed for the project.
- D. Water: Potable water free of oil, acid, alkali, salts, chlorides (except those attributable to drinking water), organic matter, or other deleterious substances.
- E. Admixtures: Use admixtures free of chlorides and alkalis (except for those attributable to drinking water). The admixtures shall be from the same manufacturer when it is required to use more than one admixture in the same concrete mix. Use admixtures compatible with the concrete mix including other admixtures.
1. Air Entraining Admixture: Conforming to ASTM C260. Proportion and mix in accordance with manufacturer's recommendations.
  2. Water Reducing Admixture: Conforming to ASTM C494, Type A. Proportion and mix in accordance with manufacturer's recommendations.
  3. High-Range Water-Reducing Admixtures (Plasticizer): Conforming to ASTM C494, Type F resulting in non-segregating plasticized concrete with little bleeding and with the physical properties of low water/cementitious ratio concrete. The treated concrete shall be capable of maintaining its plastic state in excess of 2 hours. Proportion and mix in accordance with manufacturer's recommendations.

4. Do not use admixtures causing retarded or accelerated setting of concrete without written approval from the Engineer. Use retarding or accelerating water reducing admixtures when so approved.
- F. Supplementary Cementitious Materials
1. Fly Ash: Class F fly ash complying with ASTM C618, including the requirements of Table 1 but with the Loss on Ignition (LOI) limited to 3 percent maximum and the optional physical requirements of Table 3. Test in compliance with ASTM C311 with a minimum of one sample weighing four pounds taken from each 200 tons of fly ash supplied for the project.
  2. Ground Granulated Blast Furnace Slag: Grade 100 or Grade 120 ground granulated blast furnace slag complying with ASTM C989. Ground granulated blast furnace slag shall be from a single source and uniform in color. Mill test reports submitted must be within 6 months of submittal date.
- G. Sheet Curing Materials: Waterproof paper, polyethylene film or white burlap-polyethylene sheeting, all conforming to ASTM C171.
- H. Liquid Membrane-Forming Curing Compound. Compound conforming to ASTM C309, Type 1-D (clear or translucent with fugitive dye) and containing no wax, paraffin, or oil. Curing compounds shall be non-yellowing and have a unit moisture loss no greater than 0.039 gm/cm<sup>2</sup> at 72 hours as measured by ASTM C156. Curing compound shall comply with Federal, State and local VOC limits.

## 2.03 MIXES

- A. An independent testing laboratory engaged by and at the expense of the Contractor shall establish concrete mixes and perform all sampling and laboratory testing of products and materials.
- B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce placeable, durable concrete conforming to these specifications. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing free water to collect on the surface.
- C. Base concrete mixes on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if not available, develop concrete mixes by laboratory tests using the materials proposed for the work.
1. For concrete mixes based on standard deviation data of prior mixes, submit standard deviation data of prior mixes with essentially the same proportions of the same constituents in accordance with ACI 350 and based on the modification factors for standard deviation tests contained in ACI 350.
  2. For concrete mixes developed by laboratory testing, base cementitious content of the concrete on curves showing the relation between water cementitious ratio and 7, 14 and 28 day compressive strengths of concrete made using the



proposed materials. Determine curves by four or more points, each representing an average value of at least three test specimens and one water-cementitious ratio at each age. Provide curves with a range of values sufficient to yield the desired data, including the compressive strengths specified, without extrapolation. The cementitious content of the concrete mixes to be used, as determined from the curve, shall correspond to the required average compressive strength in Table 5.3.2.2 of ACI 318. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content specified in Table 1.

- D. Test the fly ash or ground granulated blast furnace slag and concrete mixture to provide test data confirming that the fly ash or ground granulated blast furnace slag in combination with the cement to be used meets all strength requirements and is compatible with the other concrete additives.
- E. Test aggregates for potential alkali reactivity in accordance with ASTM C1260. If initial testing indicates aggregates are not potentially reactive repeat test at 3 month intervals.
- F. Compression Tests: Provide testing of the proposed concrete mixes to demonstrate compliance with the compression strength requirements in conformity with the provisions of ACI 318.
- G. Entrained air, as measured by ASTM C231, shall be as shown in Table 1.
1. If the air entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal specified under Paragraph 1.03.
- H. Slump of the concrete as measured by ASTM C143, shall be as shown in Table 1. If a high-range water-reducing admixture (plasticizer) is used, the slump indicated shall be that measured before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10-in.
- I. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of the other admixture(s).

TABLE 1

Class	Design Strength 1	Cement 2	Fine Aggregate 3	Coarse Aggregate 3	Cementitious Content 4
A	2500	Type II	Sand	57 (9)	440
E1	4500	Type II	Sand	467	560
E2	4500	Type II	Sand	57	580

W/C                      AE                      Slump

Class	Ratio 5	SCM 6	Range 7	WR 8	HRWR 10	Range Inches
A	0.62 max.	Yes	3.5 to 5	Yes	No	1-4
E1	0.42 max.	Yes	3.5 to 5	Yes	No	3-5
E2	0.42 max.	Yes	3.5 to 5	Yes	Optional	3-5

## TABLE NOTES:

1. Minimum compressive strength in psi at 28 days
2. ASTM designation in ASTM C150
3. Size Number in ASTM C33
4. Minimum cementitious content in lbs per cubic yard (where fly ash or ground granulated blast furnace slag is used cementitious content is defined as cement content plus fly ash or ground granulated blast furnace slag content)
5. W/C is Maximum Water Cementitious ratio by weight
6. Supplementary Cementitious Material (SCM) fly ash content in the range of 20-25 percent of the total cement content plus fly ash content, by weight. If ground granulated blast furnace slag is used in lieu of fly ash, the content of ground granulated blast furnace slag shall be in the range of 25-45 percent of the total cement plus ground granulated blast furnace slag content, by weight
7. AE is percent air entrainment
8. WR is water reducing admixture
9. Except as specified in Section 03800 for concrete electrical raceway encasement
10. HRWR is high-range water-reducing admixture

- J. Shrinkage Tests: Perform shrinkage tests on the design mix for Class E1 and E2 concrete. The tests shall conform to ASTM C157 as modified by ASTM C596 for curing, storage, and comparator readings. Use concrete specimens. Do not use mortar specimens.

1. The average shrinkage at 25 days of air storage shall not exceed 0.036 percent.

## PART 3 EXECUTION

### 3.01 MEASURING MATERIALS

- A. Provide concrete composed of portland cement, fly ash or ground granulated blast furnace slag, fine aggregate, coarse aggregate, water and admixtures as specified and produced by a plant complying with ACI 318 and ASTM C94. Batch all constituents, including admixtures, at the plant. High-range water reducing admixtures may be added in the field.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Use scales last certified by the local Sealer of Weights and Measures within one year of use.
- C. Weigh cement and fly ash or ground granulated blast furnace slag in individual weigh batchers that are separate and distinct from the weigh batchers used for other materials. When cement and fly ash or ground granulated blast furnace slag are weighed in a cumulative weigh batcher, the cement shall be weighed first.

- D. Measure the amount of free water in fine aggregates within 0.5 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batch tickets.
- E. Dispense admixtures either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
  - 1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
  - 2. Inject multiple admixtures separately during the batching sequence.

### 3.02 MIXING AND TRANSPORTING

- A. Provide ready-mixed concrete produced by equipment complying with ACI 318 and ASTM C94 and produced by a plant certified by the NRMCA. Do not hand-mix. All truck mixers shall carry a rating plate conforming to TMMB 100. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- B. Transport ready-mix concrete to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Engineer. Incorporate water directed to be added by additional mixing of at least 50 revolutions at mixing speed after the addition of all water. Meter all added water and show the amount of water added on each delivery ticket.
- D. Comply with ACI 318 and ASTM C94 for all central plant and rolling stock equipment and methods.
- E. Select equipment of size and design to provide continuous flow of concrete at the delivery end. Use metal or metal-lined non-aluminum discharge chutes with slopes not exceeding one vertical to two horizontal and not less than one vertical to three horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Do not retemper (mix with or without additional cement, aggregate, or water) concrete or mortar which has partially hardened.
- G. Handle concrete from mixer to placement providing concrete of specified quality in the placement area and not exceeding the maximum time interval specified in Paragraph 3.02 I.4. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required to avoid excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms. Remix for a minimum of 5 minutes prior to discharge or testing.

- H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Provide a printed record of the weight of cement and each aggregate as batched individually on each ticket. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Indicate for each batch the weight of fine and coarse aggregate, cement, fly ash or ground granulated blast furnace slag, and water, moisture content of fine and coarse aggregate at time of batching, and types, brand and quantity of each admixture, the quantity of concrete delivered, the time any water is added and the amount, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of transit mix truck.
- I. Temperature and Mixing Time Control
1. In cold weather (see Paragraph 3.07D) maintain the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms as indicated in Table 3.
  2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
  3. In hot weather (see Paragraph 3.07E), cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. Well-crushed ice may be substituted for all or part of the mixing water.
  4. The maximum time interval between the addition of mixing water and/or cement to the batch and the final placing of concrete in the forms shall not exceed the values shown in the following TABLE 2:

TABLE 2

AIR OR CONCRETE TEMPERATURE (WHICHEVER IS HIGHER)	MAXIMUM TIME
(27 Degree C) 80 Degree F to 90 Degree F (32 Degree C)	45 minutes
(21 Degree C) 70 Degree F to 79 Degree F (26 Degree C)	60 minutes
(5 Degree C) 40 Degree F to 69 Degree F (20 Degree C)	90 minutes

5. If an approved high-range water-reducing admixture (plasticizer) is used to produce plasticized concrete, the maximum time interval between the addition of mixing water and/or cement to the batch and the final placing of concrete in the forms shall not exceed 90 minutes.

### 3.03 INSPECTION AND COORDINATION

- A. Batching, mixing, transporting, placing and curing of concrete shall be subject to the inspection of the Engineer at all times. Advise the Engineer of readiness to proceed at least six working hours prior to each concrete placement. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing and the alignment, cleanliness and tightness of formwork. Do not place concrete without the inspection and acceptance of the Engineer.

### 3.04 EMBEDDED ITEMS

- A. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, anchors, inserts and other items furnished under other Sections and required to be embedded into concrete. Set and secure such items in the locations and alignments needed so they are not displaced by concrete placement.
- B. Clean embedded items free of rust, mud, dirt, grease, oil, ice, or other contaminants which would reduce or prevent bonding with concrete.
- C. Coat or isolate all aluminum embedments to prevent aluminum-concrete reaction or electrolytic action between aluminum and steel.
- D. Do not embed piping in concrete unless shown on the Drawings.
- E. Do not embed electrical conduits in concrete unless shown on the Drawings.
- F. Fabricate piping and conduit such that the cutting, bending, or relocation of reinforcing steel is not required. Pipes and conduits embedded within a slab or wall (other than those merely passing through) shall satisfy the following, unless otherwise shown on the Drawings or approved:
  - 1. Maximum outside dimension of pipe or conduit shall not be greater than one third the overall thickness of the slab or wall.
  - 2. Spacing of pipes or conduits shall be greater than or equal to three diameters or widths on center.
- G. Close open ends of piping, conduits, and sleeves embedded in concrete with caps or plugs prior to placing concrete.
- H. Ensure all specified tests and inspections on embedded piping are completed and satisfactory before starting concrete placement. Ensure all mechanical or electrical tests and inspections are completed and satisfactory prior to starting concrete placement. Do not place concrete until unsatisfactory items and conditions have been corrected.
- I. Position embedded anchor bolts using templates.
- J. Check location, alignment, and support of anchor bolts, piping, electrical conduits, and other items which will be fully or partially embedded in concrete before depositing concrete. Correct mislocated and misaligned items and secure items which have become loose before depositing concrete.
- K. Correct all embedded items not installed in the location or alignment needed or displaced by concrete placement at no additional cost to the Owner.

### 3.05 CONCRETE APPEARANCE

- A. Remix concrete showing either poor cohesion or poor coating of the coarse aggregate with paste. Reject remixed concrete showing either poor cohesion or poor coating of the coarse aggregate with paste. Make, at no additional cost to the Owner, changes in the concrete mix design for future deliveries only by adjusting one or more of the following if the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed:
1. The gradation of aggregate.
  2. The proportion of fine and coarse aggregate.
  3. The percentage of entrained air, within the allowable limits.
- B. Provide concrete having a homogeneous structure which, when hardened, will have the specified strength, durability and appearance. Provide mixtures and workmanship such that concrete surfaces, when exposed, will require no finishing except as specified in Section 03 35 00.

### 3.06 PLACING AND COMPACTING

- A. Placing
1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, standing water, dirt, debris, and other foreign materials from forms and exposed joint surfaces. Confirm that reinforcement and other embedded items are securely in place. Have a worker at the location of the placement who can check that reinforcement and embedded items remain in designated locations and alignments while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Do not place concrete on frozen subgrade, snow, or ice.
  2. Deposit concrete as near its final position as possible to prevent segregation due to rehandling or flowing. Place concrete continuously at a rate that allows the concrete previously placed to be integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
  3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes chosen for pumping and submit for approval. Do not use pipelines made of aluminum or aluminum alloy. When concrete is pumped, slump will be determined at point of truck discharge and air content will be determined at point of placement.

4. Remove temporary spreaders from forms when the spreader is no longer needed. Temporary spreaders may remain embedded in concrete only when made of galvanized steel or concrete and if prior approval has been obtained.
  5. Do not place concrete for supported elements until concrete previously placed in the supporting element has attained design strength.
  6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms to bring the full surface of the mortar against the form. Prevent the formation of surface voids.
  7. Slabs
    - a. After bulkheads, screeds and jointing materials have been positioned, place concrete continuously between joints beginning at a bulkhead, edgeform, or corner. Place each batch into the edge of the previously placed concrete to avoid stone pockets and segregation.
    - b. Avoid delays in placement. If there is a delay in placement, spade and consolidate the concrete placed after the delay at the edge of the previously placed concrete to avoid cold joints. Bring concrete to correct level and strike off with a straightedge. Use bullfloats or darbies to smooth the surface, leaving it free of humps or hollows.
    - c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow one hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist to prevent cold joints.
  8. Formed Concrete
    - a. Place concrete in forms using tremie tubes taking care to prevent segregation. Maintain bottom of tremie tubes in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12-in to 24-in lifts, keeping the surface horizontal. If a high-range water-reducing admixture is used do not permit concrete to drop freely more than 15-ft; maximum lift thickness not to exceed 7-ft.
  9. Bollards
    - a. Conform to requirements specified above for formed concrete and completely fill pipe with concrete as indicated.
  10. Do not place concrete underwater unless approved in writing by the Engineer.
- B. Compacting
1. Consolidate concrete by vibration and puddling, spading, rodding or forking so that concrete is completely worked around reinforcement, embedded items and openings and into corners of forms. Continuously perform puddling, spading, rodding and forking along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.
  2. Compact all concrete with mechanical vibrators. Do not order concrete until vibrators (including standby units in working order) are on the job.

3. Use mechanical vibrators having a minimum frequency of 8000 vibrations per minute. Insert vibrators and withdraw at points from 18-in to 30-in apart. Vibrate sufficiently at each insertion to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep standby vibrators on the site during concrete placing operations.
4. Concrete Slabs: Vibration for concrete slabs less than 8-in thick shall be by vibrating screeds. Vibration for concrete slabs 8-in and thicker shall be by internal vibrators and (optionally) with vibrating screeds. Place vibrators into concrete vertically. Do not lay vibrators horizontally or lay over.
5. Walls and Columns: Use internal vibrators (rather than form vibrators) unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down (level) the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. Insert vibrators vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration: Use vibrators to consolidate properly placed concrete. Do not use vibrators to move or transport concrete in the forms. Continue vibration until:
  - a. Frequency of vibrator returns to normal.
  - b. Surface appears liquefied, flattened and glistening.
  - c. Trapped air ceases to rise.
  - d. Coarse aggregate has blended into surface, but has not disappeared.

### 3.07 CURING AND PROTECTION

- A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.
- B. Curing Methods
  1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain a temperature of at least 50 Degrees F at the concrete surface for a minimum of seven days after placement. Use the following curing methods as specified:
    - a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin water curing as soon as concrete attains an initial set and maintain water curing 24 hours a day. Do not permit the surface of the concrete to dry out at any time during the curing period. Temperature of curing water shall be within 20 Degrees F of the concrete temperature.
    - b. Sheet Material Curing: Cover entire surface with sheet material. Anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
    - c. Liquid Membrane Curing: Apply over the entire concrete surface except as follows. Curing compound shall NOT be placed on any concrete surface where additional concrete or grout is to be placed, where concrete sealers



or surface coatings are to be used, or where the concrete finish requires an integral floor product. Apply curing compound as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Apply in compliance with the manufacturer's recommendations.

2. Specified applications of curing methods:
    - a. Slabs for Liquid Retaining Structures: Water curing only.
    - b. Slabs on Grade and Footings (not used to retain liquids): Water curing, sheet material curing or liquid membrane curing.
    - c. Structural Slabs (other than Liquid Retaining Structures): Water curing or liquid membrane curing.
    - d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.
    - e. Formed Surfaces: None if nonabsorbent forms are left in place seven days. Water curing if absorbent forms are used. Water curing if forms are removed prior to seven days. Sheet cure or liquid membrane cure if forms are removed prior to seven days. Exposed horizontal surfaces of formed walls or columns shall be water cured for seven days or until next placement of concrete is made.
    - f. Surfaces of Concrete Joints: Water curing or sheet material curing.
- C. Protect finished surfaces and slabs from the direct rays of the sun to prevent checking and crazing.
- D. Cold Weather Concreting
1. For this Specification, "cold weather" is defined as a period when for more than three successive days, the average daily outdoor temperature drops below 40 degrees F. Calculate average daily temperature as the average of the highest and the lowest temperature during the period from midnight to midnight.
  2. Batch, deliver, place, cure and protect concrete during cold weather in compliance with the recommendations of ACI 306R and the additional requirements of this Section.
  3. Review the cold weather concreting plan at the preconstruction meeting. Include the methods and procedures for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete and the procedures to be implemented upon abrupt changes in weather conditions or equipment failures.
  4. The minimum temperature of concrete immediately after placement and during the protection period shall be as indicated in Table 3. The temperature of the concrete in place and during the protection period shall not exceed these values by more than 20 degrees F. Prevent overheating and non-uniform heating of the concrete.

TABLE 3

Concrete Temperatures Minimum  
Dimension of Section

	<u>≤ 12-in</u>	<u>12 to 36-in</u>
Min. conc temp:	55 Degree F	50 Degree F

5. Protect concrete during periods of cold weather to provide continuous warm, moist curing (with supplementary heat when required by weather conditions) for a total of at least 350 degree-days of curing.
  - a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 7 days at an average 50 degrees F = 350 degree-days).
  - b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
6. Do not use salt, manure or other chemicals for protection.
7. At the end of the protection period, allow the concrete to cool gradually to the ambient temperature. If water curing has been used, do not expose concrete to temperatures below those shown in Table 3 until at least 24 hours after water curing has been terminated and air dry concrete for at least 3 days prior to first exposure to freezing temperatures.
8. During periods not defined as cold weather, but when freezing temperatures are expected or occur, protect concrete surfaces from freezing for the first 24 hours after placing.

E. Hot Weather Concreting

1. For this Specification, "hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation as estimated in ACI 305R, approaching or exceeding 0.2 pounds per square foot per hour (lb/sq ft/hr).
2. Batch, deliver, place, cure and protect concrete during hot weather in compliance with the recommendations of ACI 305R and the additional requirements of this Section.
  - a. Temperature of concrete being placed shall not exceed 90 degrees F. Maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall not cause loss of slump, flash set or cold joints.
  - b. Promptly deliver concrete to the site and promptly place the concrete upon its arrival at the site, not exceeding the maximum time interval specified in Paragraph 3.021.4. Provide vibration immediately after placement.
  - c. The Engineer may direct the Contractor to immediately cover concrete with sheet curing material.

3. Review the hot weather concreting plan at the preconstruction meeting. Include the methods and procedures for use during hot weather including production, placement, and curing.

### 3.08 REMOVAL OF FORMS

- A. Do not remove forms before the concrete has attained a strength of at least 70 percent of its specified design strength for beams and slabs and at least 30 percent of its specified design strength for walls and vertical surfaces, nor before reaching the following number of day-degrees of curing (whichever is the longer):

TABLE 4

Forms for	Degree Days
Beams and slabs	500
Walls and vertical surfaces	100

(See definition of degree-days in Paragraph 3.07D).

- B. Do not remove shores until the concrete has attained at least 70 percent of its specified design strength and also sufficient strength to support safely its own weight and the construction live loads upon it.
- C. In cold weather, when temperature of concrete exceeds ambient air temperature by 20 Degrees F at the end of the protection period, loosen forms and leave in place for at least 24 hours to allow concrete to cool gradually to ambient air temperature.

### 3.09 FIELD AND LABORATORY TESTS

- A. Take field control cylinder specimens during the progress of the work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each class of concrete placed each day shall not be less than one set per day, nor less than one set for each 100 cu yds of concrete nor less than one set for each 5,000 sq ft of surface area for slabs or walls. Specimens shall be formed in 6-in diameter by 12-in long non-absorbent cylindrical molds.
  1. A "set" of test cylinders shall consist of five cylinders: one to be tested at seven days, one to be tested at 14 days, and two to be tested and their strengths averaged at 28 days. The fifth may be used for a special test at 3 days or to verify strength after 28 days if 28 day test results are low.
  2. When the average 28 day compressive strength of the cylinders in any set falls below the required compressive strength or below proportional minimum seven-day or 14-day strengths (where proper relation between seven, 14 and 28 day strengths have been established by tests), change proportions, cementitious content, or temperature conditions to achieve the required strengths at no additional cost to the Owner.

- B. Provide four firmly braced, insulated, heated, closed wooden curing boxes, each sized to hold ten specimens, complete with cold weather temperature and hot weather temperature control thermostat for initial curing and storage from time of fabrication until shipment to testing lab. Protect the specimens against injury or loss through construction operations.
- C. Test slump immediately prior to placing the concrete. Test shall be made in accordance with ASTM C143. When concrete is pumped, slump will be determined at point of truck discharge. If the slump is outside the specified range, the concrete will be rejected.
- D. Test for air content shall be conducted on a fresh concrete sample. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If aggregates with high absorptions are used, the latter test method shall be used. When concrete is pumped, air content will be determined at point of placement.

### 3.10 FIELD CONTROL

- A. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work. The right of the Engineer to take such cores shall not be construed as creating any obligation to take such cores, and not exercising this right to do so shall not relieve the Contractor from meeting the requirements of these Specifications.
- B. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Repair all core holes with non-shrink grout as specified in Section 03 60 00. The work of cutting, testing and repairing the cores will be at the expense of the Contractor if defective work is uncovered. If no defective work is found, such cost will be at the expense of the Owner.

### 3.11 FAILURE TO MEET REQUIREMENTS

- A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer may require changes in proportions or materials, or both, to apply to the remainder of the work in accordance with Paragraph 1.05E. Furthermore, the Engineer may require additional curing on those portions of the structure represented by the test specimens which fall below the values given in Table 1. The cost of such additional curing shall be at no additional cost to the Owner. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer may require strengthening or replacement of those portions of the structure which fail to develop the required strength. Coring and testing and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be at no additional cost to the Owner. In such cases of failure to meet strength requirements the Contractor and Owner shall confer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and

"Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in C94 is the Contractor.

- B. When the tests on control specimens of concrete fall below the required strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In cases where tests of cores fall below the values given in Table 1, the Engineer, in addition to other recourses, may require load tests on any one of the slabs and walls in which such concrete was used. Test need not be made until concrete has aged 60 days. The Engineer may require strengthening or replacement of those portions of the structure which fail to develop the required strength. All coring and testing and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be at no additional cost to the Owner.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28 day strength, the concrete shall be rejected and shall be removed and replaced at no additional cost to the Owner.

### 3.12 PATCHING AND REPAIRS

- A. It is the intent of these Specifications to require quality work including forming, mixture and placement of concrete and curing so completed concrete surfaces will require no patching or repairs.
- B. As soon as the forms have been stripped and the concrete surfaces exposed: remove fins and other projections; fill recesses left by the removal of form ties; and repair surface defects which do not impair structural strength. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.
- C. Immediately after removal of forms remove tie cones and metal portions of ties as specified in Section 03 10 00. Fill holes promptly upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spider web. Trowel smooth with heavy pressure. Avoid burnishing.
- D. When filling tie cone holes and patching or repairing exposed surfaces use the same source of cement and sand as used in the parent concrete. Adjust color to match by addition of white cement. Rub lightly with a fine carborundum stone at an age of one to five days if necessary to bring the surface down with the parent concrete. Do not damage or stain the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.
- E. Defective concrete and honeycombed areas: Chip down square and at least 1-in deep to sound concrete with hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded in the parent concrete. If honeycomb exists around reinforcement, chip to provide a clear space at least 3/8-in wide all around the steel. For areas less than 1-

1/2-in deep, the patch may be made in the same manner as described above for filling form tie holes, care being exercised to use adequately dry (non-trowelable) mixtures and to avoid sagging. Thicker repairs will require build-up in successive 1-1/2-in layers on successive days, each layer being applied (with slurry, etc.) as described above. For deep repairs the Engineer may require an alternate repair method. Submit repair method for defective concrete to the Engineer for Approval prior to starting work.

- F. For very heavy (generally formed) patches, the Engineer may order the addition of pea gravel to the mixture and the proportions modified as follows:

<u>Material</u>	<u>Volumes</u>	<u>Weights</u>
Cement	1.0	1.0
Sand	1.0	1.0
Pea Gravel	1.5	1.5

- G. The Contractor may use a pre-packaged patching compound, such as: Poly-Patch by Euclid Chemical Company; Sikatop 122 Plus by Sika Chemical Corporation or equal only if approved by the Engineer for use and for color match.

### 3.13 SCHEDULE

- A. The following (Table 5) are the general applications for the various concrete classes and design strengths:

TABLE 5

<u>Class</u>	<u>Design Strength</u> (psi)	<u>Description</u>
A	2,500	Concrete fill, concrete fill for bollards and pipe encasement.
E1	4,500	Structural concrete foundation mats and slabs, walls, and footings 16-in and greater in thickness.
E2	4,500	Except as noted above for Class E1 concrete: Structural concrete greater than 10-in in thickness including walls, slabs on grade, elevated slab and beam systems, grade beams, piles, pile caps and all other structural concrete greater than 10-in in thickness.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and finish cast-in-place concrete surfaces as specified herein.

### 1.02 RELATED WORK

- A. Concrete and finishing for walkway and pavements is included in Division 32.
- B. Concrete formwork is included in Section 03 10 00.
- C. Patching and repair of defective and honeycombed concrete is included in Section 03 30 00.
- D. Grout is included in Section 03 60 00.
- E. Waterproofing, dampproofing and caulking are included in Section 07 11 13.
- F. Painting, toppings and special surfaces are included in Division 09.

### 1.03 REFERENCE STANDARDS

- A. ASTM International
  - 1. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

### 1.04 RESPONSIBILITY FOR CHANGING FINISHES

- A. The surface finishes specified for concrete to receive coatings or other finish materials are those required for the proper application of the products specified under other Sections. Where products different from those specified are approved for use determine if changes in finishes are required and provide the proper finishes to receive these products.
- B. Perform changes in finishes made to accommodate products different from those specified at no additional cost to the Owner. Submit the proposed new finishes to the Engineer for approval.

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## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Cementitious and component materials required for finishing concrete surfaces: As specified in Section 03 30 00.

## PART 3 EXECUTION

### 3.01 FORMED SURFACES

- A. Form removal: Conform to Sections 03 10 00 and 03 30 00.
- B. Do not damage edges or obliterate the lines of chamfers, rustications or corners when removing the forms or doing any other work adjacent thereto.
- C. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.
- D. Off-Form Finish
  - 1. Remove fins and other projections and fill tie cones and defects as specified in Section 03 30 00.
- E. Rubbed Finish
  - 1. Immediately upon stripping forms and before concrete changes color, carefully remove all fins with a hammer. While the surface is still damp apply a thin coat of medium consistency neat cement slurry using bristle brushes to provide a bonding coat within all pits, air holes or blemishes in the parent concrete. Do not coat large areas of the surface with this slurry.
  - 2. Before the slurry dries or changes color, apply a dry (almost crumbly) grout consisting of one volume cement to 1-1/2 volumes of clean masonry sand having a fineness modulus of approximately 2.25 and complying with the gradation requirements of ASTM C144. Apply grout uniformly using damp (neither dripping wet nor dry) pads of coarse burlap approximately 6-in square used as a float. Scrub grout into the pits and air holes to provide a dense mortar in the imperfections to be patched.
  - 3. Allow the mortar to partially harden for one or two hours depending upon the weather. If the air is hot and dry, keep the surface damp during this period using a fine, fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the perpendicular edge of a steel trowel without damaging the grout in the small pits or holes, cut off all grout that can be removed with a trowel. Grout allowed to remain on the surface too long will get too hard and will be difficult to remove.



4. Allow the surface to dry and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout should remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow grout to dry after it has been cut off with the trowel so it can be wiped off clean with the burlap.
5. On the day following the repair of pits, air holes and blemishes, the surfaces again shall be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild abrasive. After this treatment, there shall be no built-up film remaining on the parent surface. If, however, a built-up film remains, use a fine abrasive stone to remove all such material without breaking through the surface film of the original concrete. Scrub lightly to remove excess material without working up a lather or mortar or changing the texture of the concrete.
6. Follow the final bagging or stoning operation with a thorough wash-down with stiff bristle brushes to remove extraneous materials from the surface. Spray the surface with a fine fog spray periodically to maintain a continually damp condition for at least 3 days after the application of the repair grout.
7. The Rubbed Finish application may be deleted by the Engineer if the unfinished concrete surface is of superior quality and without surface voids.

### 3.02 FLOORS AND SLABS

- A. Consider the potential for longer setting time in concrete containing fly ash or ground granulated blast furnace slag.
- B. Compact with internal vibrators as specified in Section 03 30 00 and screed to the established grades. Provide floors and slabs level with a tolerance of 1/8-in when checked with a 12-ft straightedge, except where drains occur, in which case pitch floors to drains as indicated. Failure to meet either of above shall be cause for removal, grinding, or other correction as directed by the Engineer, at no additional cost to the Owner.
- C. Following screeding as specified above, float the slabs as approved by the Engineer. Continue floating operation until sufficient mortar is brought to the surface to fill all voids. Test the surfaces with a straightedge to detect high and low spots which shall be eliminated. Do not overwork the concrete as evidenced by excess water and fine material on the surface.
- D. Do not use "jitterbugs" or other special tools designed for the purpose of forcing the coarse aggregate away from the surface and allowing a layer of mortar to accumulate on any slab finish. Do not dust surfaces with dry materials. Round off all edges of slabs and tops of walls with a steel edging tool. Use steel edging tool with radius of 1/4-in for all slabs subject to wheeled traffic.
- E. Measure floor flatness the day after a concrete floor is finished and before the shoring is removed, in order to eliminate any effects of shrinkage, curling and deflection. A 12-ft long straightedge shall be supported at each end with steel gauge blocks whose thickness are equal to tolerance specified. Floor surface shall not have crowns so high

as to prevent 12-ft straightedge from resting on the two end blocks, nor low spots so low that a third block of twice the tolerance in thickness can pass under the supported straightedge. Compliance with the designated limits in four of five consecutive measurements will confirm compliance, unless obvious faults are observed. A check for adequate slope and drainage will also be made to confirm compliance.

#### F. Descriptions

1. Steel Trowel Finish. Finish by screeding and floating with straightedges to bring the surfaces to the elevations indicated. While the concrete is still green, but sufficiently hardened to bear a person's weight without deep imprint, the surface shall be wood floated to a true, even plane with no coarse aggregate visible. Apply sufficient pressure on the wood floats to bring moisture to the surface. After surface moisture has disappeared, hand steel trowel to produce a smooth, impervious surface, free from trowel marks. Trowel the surface again for the purpose of burnishing. The final troweling shall produce a ringing sound from the trowel. Do not use dry cement or additional water in troweling.
2. Wood Float Finish. Finish by screeding with straightedges to bring the surfaces to the elevations indicated. Use a wood float to compact and seal surface. Remove all laitance and leave a clean surface.
3. Light Broomed Finish. Steel trowel finish the concrete, as specified above but omit the final troweling and finish the surface by drawing a fine-hair broom lightly across the surface. Broom in the same direction and parallel to expansion joints, or in the case of inclined slabs, perpendicular to the slope, or except as directed otherwise.
4. Broomed Finish. Steel trowel finish the concrete, as specified above but omit the final troweling. While the concrete is still soft enough, finish the surface with a stiff coarse fiber broom to produce the pattern and depth of scoring as approved by the Engineer.
5. Power Machine Finish. In lieu of hand steel trowel finishing, an approved power machine for finishing concrete floors and slabs may be used in accordance with the directions of the machine manufacturer and as approved by the Engineer. Do not use a power machine until the concrete has attained the necessary set to allow finishing without introducing high and low spots in the slab. Hand steel trowel the areas of slabs not accessible to power equipment. Provide a final steel troweling done by hand over all areas.

### 3.03 APPROVAL OF FINISHES

- A. All concrete surfaces, when finished, will be inspected by the Engineer.
- B. Refinish or rework unsatisfactory finishes until approved by the Engineer, at no additional cost to the Owner.
- C. Hardened unsatisfactory finishes will require removal, grinding, or other appropriate correction approved by the Engineer, at no additional cost to the Owner.

### 3.04 SCHEDULE OF FINISHES

- A. Finish concrete in the various specified manners either to remain as natural concrete or to receive an additional applied finish or material under another Section. Where products different from those specified are approved for use comply with the requirements of Paragraphs 1.06A and 1.06B.
- B. Finishes to the base concrete for the following conditions shall be as scheduled below and as further specified herein:
1. Exposed exterior concrete excluding slabs and walking surfaces - Rubbed finish. (Rub open tank walls above and to 1-ft below normal water line).
  2. Concrete for exterior on stairs and other horizontal areas - Broomed finish, non-slip.
  3. Exposed interior concrete including underside slabs, beams and stairs and sides of openings, beams and stairs - Rubbed finish.
  4. Walls of open topped tanks - Rubbed finish above and to 1-ft below normal water line. Off-form finish from 1-ft below normal water line to base of wall.
  5. Tops of curbs and pads - Steel trowel finish.
  6. Concrete on which liquids flow or are contained - Steel troweled finish.
  7. Concrete not exposed in the finished work and not scheduled to receive an additional applied finish or material - Off-form finish at vertical surfaces, consolidate and screed to grade at horizontal surfaces.
  8. Concrete tank bottoms to be covered with grout - Broom finish as approved. See Section 03 60 00 for additional requirements.
  9. Concrete to receive dampproofing - Off-form finish.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

### 1.02 RELATED WORK

- A. Grout for mini-piles, is included in Division 31.
- B. Demolition and removals are included in Section 02 41 00.
- C. Concrete formwork is included in Section 03 10 00.
- D. Concrete reinforcement is included in Section 03 20 00.
- E. Concrete joints and joint accessories are included in Section 03 15 00.
- F. Cast-in-place concrete is included in Section 03 30 00.
- G. Masonry grout is included in Section 04 20 00.
- H. Miscellaneous metals are included in Section 05 50 00.

### 1.03 SUBMITTALS

- A. Submit, in accordance with Section 01 33 23, shop drawings and product data showing materials of construction and details of surface preparation, mixing and installation for:
  - 1. Commercially manufactured non-shrink cementitious grout. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.
  - 2. Cement grout. Include the type and brand of cement, the gradation of fine aggregate, product data on any proposed admixtures and the proposed grout mix.
  - 3. Concrete grout. Include data as required for concrete as delineated in Section 03 30 00 and for fiber reinforcement as delineated in Section 03 20 00.
- B. Laboratory Test Reports
  - 1. For concrete grout, submit laboratory test data as required for concrete as delineated in Section 03 30 00.
- C. Qualifications

1. Submit documentation that grout manufacturers have a minimum of 10 years experience in the production and use of the grouts proposed.

## 1.04 REFERENCE STANDARD

### A. ASTM International

1. ASTM C33 - Standard Specification for Concrete Aggregates
2. ASTM C150 - Standard Specification for Portland Cement
3. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
4. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
5. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
6. ASTM E329 - Standard specification for agencies engaged in the testing and/or inspection of materials used in construction

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 QUALITY ASSURANCE

### A. Qualifications

1. Grout manufacturers shall have a minimum of 10 years' experience in the production and use of the type of grout proposed.

### B. Field Testing

1. All field testing and inspection services will be provided by the Owner. Assist in the sampling of materials, and cooperate by allowing free access to the work and permitting the use of ladders, scaffolding, and such incidental equipment as may be required. Methods of testing will comply with the applicable ASTM Standards.
2. Field testing of concrete grout will be as specified for concrete in Section 03 30 00.

## 1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

- B. Store materials in full compliance with the manufacturer's recommendations. Limit total storage time from date of manufacture to date of installation to six months or the manufacturer's recommended storage time, whichever is less.
- C. Remove immediately from the site material which becomes damp, contains lumps, or is hardened and replace with acceptable material at no additional cost to the Owner.
- D. Deliver non-shrink cementitious grout as a pre-portioned blend in prepackaged mixes requiring only the addition of water.

## 1.07 DEFINITIONS

- A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.
- B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

### 2.02 MATERIALS

- A. Non-shrink Cementitious Grout

- 1. Non-shrink cementitious grouts: Conform to ASTM C1107. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.
  - a. General purpose non-shrink cementitious grout: Conform to the standards stated above. SikaGrout 212 by Sika Corp.; Set Grout by BASF Building Systems; NS Grout by The Euclid Chemical Co.; Five Star Grout by Five Star Products, Inc., or equal.
  - b. Flowable (Precision) non-shrink cementitious grout: Conform to the standards stated above. Masterflow 928 by BASF Building Systems; Hi-Flow Grout by The Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Five Star Grout by Five Star Products, Inc., or equal.

- B. Cement Grout

- 1. A mixture of one part portland cement conforming to ASTM C150, Type I, II, or III and one to two parts sand conforming to ASTM C33 with sufficient water to

place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.

C. Concrete Grout

1. Conform to the requirements of Section 03 30 00 except as specified herein. Proportion with Type II cement, coarse and fine aggregates, water, water reducing admixture and air entraining agent to produce a mix having an average strength of 3500 psi at 28 days (2500 psi nominal strength). Coarse aggregate size shall be 3/8-in maximum. Slump shall not exceed 5-in. Minimum cement content shall be 540 lbs per cubic yard and maximum water to cement ratio shall be 0.45.
2. Add synthetic reinforcing fibers as specified in Section 03 20 00 to the concrete grout mix at the rate of 1.5 lbs of fibers per cubic yard of grout. Add fibers from the manufacturer's pre-measured bags and according to the manufacturer's recommendations to ensure complete dispersion of the fiber bundles as single monofilaments within the concrete grout.

D. Self-Leveling Cementitious Underlayment Grout

1. Grout shall be portland cement based, non-shrinking, self-leveling underlayment, factory prepared and packaged. Underlayment Self-Leveling by BASF Building Systems, Levelayer by Dayton Superior, Flo-Top by the Euclid Chemical Company, or equal providing a one day compressive strength of 1200 psi minimum and a 28 day value of 3000 psi minimum.
2. Provide polymer emulsion, system primer for substrate preparation, Primer 800 by BASF Building Systems, Level Primer J42 by Dayton Superior, Tammsweld by the Euclid Chemical Company, or equal for the specific product proposed.
3. Provide clean, dry and sound pea gravel, 1/4-in maximum and 1/8-in minimum size and conforming to ASTM C33 (Provide 1/8-in maximum size, clean, dry and sound sand conforming to ASTM C33 for the equal specific product).

E. Water

1. Potable water free of oil, acid, alkali, salts, chlorides (except those attributable to drinking water), organic matter, or other deleterious substances.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Place grout where indicated or specified over cured concrete which has attained its specified design strength unless otherwise approved by the Engineer.
- B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, dust, grease, oil, form release agent, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.



- C. Roughen concrete surfaces by chipping, sandblasting, or other dry mechanical means to bond the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.
  - 1. Air compressors used to clean surfaces in contact with grout shall be the oilless type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.
- D. Remove all loose rust, oil or other deleterious substances which may affect the bond or performance of the grout from metal embedments or bottom of baseplates prior to the installation of the grout.
- E. Wash concrete surfaces clean and then keep moist for at least 24 hours prior to the placement of non-shrink cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, or flooding the surface or other method acceptable to the Engineer. Upon completion of the 24-hour period, remove visible water from the surface prior to grouting.
- F. Provide forms for grout. Line or coat forms with release agents recommended by the grout manufacturer. Provide forms anchored in place and shored to resist the forces imposed by the grout and its placement.
  - 1. Forms for all grout other than concrete grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.
- G. Level and align the structural or equipment bearing plates in accordance with the structural requirements or the recommendations of the equipment manufacturer, as applicable.
- H. Support equipment during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by bond breaking coatings and removed after grouting unless otherwise approved by the Engineer. Grout voids created by the removal of shims, wedges and blocks.

### 3.02 INSTALLATION - GENERAL

- A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and these specifications.
- B. Provide staffing and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.
- C. Maintain temperatures of the base plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the grout manufacturer, whichever is longer. Do not allow differential heating or cooling of baseplates and grout during the curing period.

- D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 40 to 90 degrees F range.
- E. Install grout to preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or partial contraction joint.
- F. Reflect all existing underlying expansion, partial contraction and construction joints through the grout.

### 3.03 INSTALLATION – NON-SHRINK CEMENTITIOUS GROUTS AND CEMENT GROUTS

- A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.
- B. Do not mix by hand. Mix in a mortar mixer with moving blades. Pre-wet the mixer and empty excess water. Add pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.
- C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.
- D. Provide forms as specified in Paragraph 3.01G. Place grout into the designated areas and prevent segregation and entrapment of air. Do not vibrate grout to release air or to consolidate the material. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.
- E. Place grout rapidly and continuously to avoid cold joints. Do not place grout in layers. Do not add additional water to the mix (retemper) after initial stiffening.
- F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree angle from the lower edge of bearing plate unless otherwise ordered and approved by the Engineer. Finish this surface with a wood float or brush finish.
- G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the manufacturer, whichever is longer. Saturate the grout surface by use of saturated burlap bags, soaker hoses or ponding. Provide sunshades. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

### 3.04 INSTALLATION – CONCRETE GROUT

- A. Inspect slabs finished under Section 03 35 00 and scheduled to receive concrete grout. Protect and keep the surface clean until placement of concrete grout.

- B. Remove debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Pressure wash the surface. Do not flush debris into tank drain lines.
- C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout by use of saturated burlap bags, soaker hoses or ponding. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8-in thick cement paste.
- D. Place concrete grout to final grade using the scrapers of the installed mechanical equipment as a guide for surface elevation and to eliminate high and low spots. Unless specifically approved by the equipment manufacturer, mechanical scraper mechanisms powered by their motors shall not be used as a finishing machine or screed to push grout.
- E. Provide grout control joints as indicated on the Drawings.
- F. Steel trowel finish as specified in Section 03 35 00. Cure the concrete grout as specified for cast-in-place concrete in Section 03 30 00.

### 3.05 INSTALLATION – SELF-LEVELING CEMENTITIOUS UNDERLAYMENT GROUT

- A. Perform work generally as follows but conform to installation procedures as submitted and approved.
- B. Removal of flooring and underlying fill concrete material are included under Division 02. Provide additional substrate preparation as required to ensure proper bond of the grout system.
- C. Prime the prepared substrate with the system primer and remove all puddles. Allow to dry completely.
- D. Mix underlayment grout with water and the approved aggregate only and in the approved proportions to be flowable and self-leveling.
- E. Install in one lift for all locations and allow to level. Completely fill the required areas allowing no voids in the grout thickness. Slope to floor drains as required.
- F. Cure in conformance with manufacturer's instructions. Do not allow conditions which would permit premature drying.
- G. Protect the grouted areas as approved until finish material is applied under Division 09 9.

### 3.06 SCHEDULE

- A. The following list indicates where the particular types of grout are to be used:

1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is indicated on the Drawings, except for base plates greater in area than 3-ft wide by 3-ft long.
2. Flowable (precision) non-shrink cementitious grout: Use under all base plates greater in area than 3-ft wide by 3-ft long. Use at all locations indicated on the Drawings to receive flowable (precision) non-shrink grout. Flowable (precision), non-shrink, cementitious grout may be substituted for general purpose non-shrink cementitious grout.
3. Cement grout: Use where indicated on the Drawings.
4. Concrete grout: Use for concrete grout fill within liquid retaining structures and other locations where specifically indicated on the Drawings.
5. Self-leveling cementitious underlayment grout: Use over existing slab as shown and required to provide substrate for tile work.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Work described under this section pertains to excavations, dewatering, excavation support systems, pipe jacking, and/or other construction activities that may cause ground deformation and vibrations.
- B. Furnish all material, equipment, labor and services required for the complete installation, maintenance, protection, and monitoring of geotechnical instrumentations and reporting of collected data for all instrumentation as specified in this Section, and as necessary to monitor construction performance and impacts on adjacent facilities.
- C. Furnishing, installing, monitoring and report observation wells to monitor groundwater levels as specified in this Section.
- D. Conduct pre-construction surveys as specified herein.
- E. Coordinate and obtain all permissions required, both public and private, to install geotechnical instrumentation.
- F. Install instruments with the Engineer present to observe their installation.
- G. Establish response actions to be taken if the maximum allowable instrument readings are exceeded so that existing structures and utilities are protected from damage. Implement response actions if maximum allowable instrument readings are exceeded.
- H. Dispose of all instruments at the end of the project.

### 1.02 RELATED WORK

- A. Earthwork is included in Section 31 23 00.
- B. Dewatering and Drainage are included in Section 31 23 19.
- C. Trenching, Backfilling and Compaction is included in Section 31 23 33.
- D. Excavation Support and Protection is included in Section 31 75 01.
- E. Jacking Under Railroads is included in Section 33 05 25.

### 1.03 PURPOSE OF THE GEOTECHNICAL INSTRUMENTATION PROGRAM

- A. The purpose of the geotechnical instrumentation is to monitor:
  - 1. Performance of the Contractor's excavation support system.

2. Performance of the Contractor's trenchless excavation systems.
3. Groundwater levels inside and outside the limits of the excavation.
4. Vertical deformation of ground surface adjacent to the work.
5. Vertical and horizontal deformation of existing utilities and structures adjacent to the work.

#### 1.04 RESPONSIBILITIES OF CONTRACTOR

- A. Prior to commencing any demolition, support of excavation installation, excavation, trenchless crossing, micropile installation and dewatering work, furnish components of instrumentation that are to be installed during construction.
- B. Install instruments and establish initial baseline readings.
- C. Protect from damage and maintain instruments installed by the Contractor.
- D. Repair or replace damaged instruments furnished by the Contractor.
- E. Collect, reduce, process, plot and report settlement and deformation monitoring data obtained by survey, groundwater levels, and submit to the Engineer.
- F. Coordinate with the Engineer to verify consistency of collected data.
- G. Implement remedial measures based on interpretations of monitoring data program.

#### 1.05 SUBMITTALS

- A. Submit in accordance with Section 01 33 23.
- B. Submit for review by the Engineer the following information at least four weeks prior to instrument installation:
  1. Installation Plan and Schedule: Full details of the proposed plan and schedule for installing and monitoring instruments, including proposed locations, types, installation methods, and monitoring schedule of the instruments.
  2. The names, qualifications, and experience of the personnel or subcontractor(s) who will install the instruments, perform optical level survey and vibration monitoring, read the instruments, and report data to the Engineer demonstrating compliance with Paragraph 1.08.
  3. Layout of monitoring points, observation wells, seismographs and reference points and description of monitoring provisions, including full details of the proposed instruments, proposed plan and schedule for installing the instruments, and schedule for monitoring and data reporting.

4. Description of methods for installing and protecting all instrumentation including but not limited to seismographs, observation wells, crack gages, monitoring points, and reference points.
  5. Copies of all instrument calibrations and certifications specified.
  6. Groundwater observation well construction details including casing type, filter gradation, screen interval, grout mix, drilling methods, and depth of wells.
  7. For all instrumentation installed in borings provide a detailed procedure for installation, including post installation acceptance test, together with a sample installation record sheet. The installation procedures shall include:
    - a. The method to be used for cleaning the inside of casing or augers.
    - b. Drill casing or auger type and size.
    - c. Depth increments for backfilling boreholes with sand and bentonite.
    - d. Method for overcoming buoyancy of instrumentation components during grouting.
    - e. Method of sealing joints in pipe casing to prevent ingress of grout.
    - f. Installations Records: Within five days of installing each instrument, submit to the Engineer, the as built instrument location as specified, and its corresponding installation record sheet. Include in the installation record sheet, but do not limit the information to, the installed location of each instrument with instrument identification numbers, established elevations, initial elevations, initial coordinates, boring log, installation and/or monitoring date and time. Furnish details of installed instruments showing all dimensions and materials used, and as built drawings of each instrument.
  8. Field Calibration: Within 5 working days of performing a field calibration, submit results of the calibration to the Engineer.
  9. Reports and Records: Provide reports of monitoring data to the Engineer. Include the following minimum information:
    - a. Pre-construction survey.
    - b. As-installed location plan, installation records and baseline values for all instrumentation.
    - c. Monitoring data for all instruments with plots against threshold values.
    - d. Weekly records of crack monitors, including photographs with readings.
    - e. Event reports and summary from vibration monitoring.
    - f. Discussion and associated action related to any result exceeding the threshold values set herein.
  10. Certificates: For each seismograph instrument to be furnished submit a certificate issued by the instrument's manufacturer stating that the manufacturer has inspected and tested each instrument before it leaves the factory to confirm that the instrument is working correctly and has no defects or missing parts.
  11. Submit three copies of the pre-construction condition surveys as specified herein.
- C. Submit proposed remedial measures to the Engineer of action to be taken in the event that the instrument Threshold Values are reached.

## 1.06 REFERENCED STANDARDS

- A. ASTM International
  - 1. ASTM A53 / A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - 2. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.07 DEFINITIONS

- A. Surface Monitoring Points (SMPs): Inscribed marking or approved surveyor's nail installed to measure vertical (elevation) movement.
- B. Excavation Support Monitoring Points (ESMPs): Inscribed marking or fixed markers placed on excavation support systems to measure horizontal movement of the excavation support system.
- C. Groundwater Observation Wells: Screened or slotted pipe with solid riser pipe installed in a drilled hole with the annulus around the pipe backfilled with sand. Near surface groundwater levels are measured in the well.
- D. Seismographs: Electronic recording device with vibration transducer capable of monitoring and recording ground vibrations induced by construction activity.

## 1.08 QUALITY ASSURANCE

- A. The Contractor shall be responsible for all aspects pertaining to the installation, maintenance and monitoring of the geotechnical instrumentation specified herein.
- B. Personnel Qualifications for Instrument Installation.
  - 1. Employ qualified technicians with comparable experience in the installation of geotechnical instrumentation similar to that specified herein.
  - 2. Employ a qualified Geotechnical Instrumentation Engineer who is a professional engineer, with at least 5 years of experience in the installation of instrumentation specified herein, to supervise and direct technicians and be responsible for instrument installation. This person is to be present at the installation site(s) to direct and supervise the installations, oversee the reading of the instrumentation and supervise the interpretations of geotechnical instrumentation data.
- C. Installation of instrumentation shall, at all times, be performed in the presence of the Engineer.



- D. Provide each instrument specified herein from an approved manufacturer currently engaged in manufacturing geotechnical instrumentation hardware of the specified types.
- E. Surveyor Qualifications: The professional Land Surveyors shall be licensed in the State of Tennessee and with at least 3 years of experience in surveying of similar instruments. The professional Land Surveyors shall establish the Surface Monitoring Points and Excavation Support Monitoring Points and take baseline readings.
- F. Perform optical level surveys, instrument readings, and report data. Personnel responsible for this work shall be qualified by a minimum of 3 years of experience with similar work.
- G. Factory Calibration: A factory calibration shall be conducted on all seismographs prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the U.S. National Institute of Standards and Technology.
- H. Vibration monitoring shall be conducted by persons trained in the use of a seismograph and records shall be analyzed and results reported by persons familiar with analyzing and reporting the frequency content of a seismograph record.
- I. Persons responsible for pre-construction surveys shall be professional engineers, licensed in the State of Tennessee, and shall have had a minimum of 5 years of professional experience in structural evaluation and conditions surveys.

## 1.09 TOLERANCES

- A. Survey measurements for initial location of each of the instrumentation elements shall consist of determining the elevation and horizontal position with respect to benchmark(s) approved by the Engineer.
- B. Monitoring Points (SMPs and ESMPs)
  - 1. Elevations of all instrumentation shall be determined to an accuracy of plus/minus 0.01 foot.
  - 2. The horizontal position of surface monitoring points shall be determined to an accuracy of plus/minus 0.1 foot.
  - 3. The horizontal position of excavation support monitoring points shall be determined to an accuracy of plus/minus 0.01 foot.
- C. Should actual field conditions prohibit installation at the location and elevations specified in this Section, obtain prior acceptance from the Engineer for new instrument location and elevation.

## 1.10 DESIGN AND PROJECT REQUIREMENTS

- A. Project Requirements

1. Install Geotechnical Instrumentation as required herein and as necessary to monitor ground conditions, ground response, and facilities to achieve specified project requirements, and prevent damage to facilities potentially affected.
2. Install the instrumentation in accordance with the approved Instrumentation Schedule.
3. The Engineer's monitoring of the installed instruments does not relieve the Contractor of the obligation to complete the project within the requirements specified herein and the Contractor shall take additional measurements as may be necessary.

B. Pre-Construction Survey

1. Prior to start of demolition, excavation work, trenchless excavation work, installation of excavation support, installation of micropiles and dewatering work, engage the services of an independent professional engineer, licensed in the State of Tennessee, to conduct a pre-construction survey of existing structures and conditions within 50 feet of the anticipated excavation work, trenchless crossings, micropile installation, installation of excavation support and dewatering work.
  - a. Coordinate activities, issue notices, obtain clearances and provide photographic and secretarial assistance necessary to accomplish the survey.
  - b. Give notice in writing, to the property owner and any representative of local authorities required to be present at such survey. Notify in writing the dates on which surveys are planned so that representatives are present during the examination. Provide copies of notices to the Owner and Engineer.
2. Record observations of the existing conditions for residences, buildings and other structures, which are affected.
  - a. Provide the survey consisting of a description of interior and exterior conditions. Locate cracks, damage or other defects existing and include information to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exists, or for defects too complicated to describe in words, photographs shall be taken and made part of the record.
  - b. The records of each property examined must be signed by the representatives present and, if practicable, by the property owner, whether or not they are present at the examinations.
3. Record of the pre-construction survey shall consist of written documentation, video and photographs of the conditions identified. At the completion of the survey, submit copies of the documentation to the Owner.
4. Upon completion of all excavation work, installation of excavation support, installation of micropiles and dewatering work, complete a similar examination of properties and structures where complaints of damage have been received or damage claims have been filed. Give notice to interested parties so that they may be present during the final examinations. Records of the final examination shall be signed and distributed as the original pre-construction survey.

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5. Retain records in the Contractor's file for at least 3 years after completion of the Contract. In the event of damage claims, a report shall be prepared by the Contractor on the particular structures as requested by the Engineer from those notes and photographs and submitted to the Owner. Repair damage attributed to the Contractor's activity promptly and completely to the property owner's satisfaction to restore the conditions of the property to that existing prior to work.
- C. Secure all required permits prior to the installation or removal of observation wells.
  - D. Provide and facilitate safe access to the instruments at all times. The Engineer may perform additional monitoring in a manner that will minimize unnecessary work delays. Allow and facilitate instrument monitoring as required by the Engineer. No claim for lost production time due to this activity will be allowed.
  - E. Maintain all instrumentation. Replace all damaged instruments within 24 hours. Report all damaged or non functional instrumentation to the Engineer within 24 hours.
  - F. Availability of Data
    1. Interpretations developed by the Engineer will be available to Contractor. Contractor may observe readings at any time or take their own supplementary readings.
    2. Monitoring data is the property of the Owner and is not to be disclosed or published to third parties without the owner's written permission.
    3. Contractor is expected to make their own interpretations for their own purposes at no additional cost to the Owner.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. General: All instruments and materials, including readout units, remain the property of the Contractor following completion of the Contract.
- B. Furnish all installation tools, materials, and miscellaneous instrumentation components.
- C. Surface protection for all instruments provided shall be flush with the surface in paved or other ground surface areas, at the time that the work is completed.
- D. The minimum quantity of instruments to be furnished is as follows:

<u>Instrument</u>	<u>Minimum No. of Units</u>	<u>Approximate Installed Depth</u>
Observation Wells	1	10 feet below bottom of tunnel invert or excavation at trenchless crossing location
Observation Wells	2	10 feet below bottom of excavation at Pump Station and Diversion Structure Excavation
Seismographs	1	N/A
Surface Monitoring Points	7	N/A
Excavation Support Monitoring Points	As needed	N/A

- E. Locations and number of instruments shall be determined by the Contractor and approved by the Engineer.

## 2.02 GROUNDWATER OBSERVATION WELLS

- A. Observation wells will be used to monitor the groundwater levels outside the excavation.
- B. Pipe shall consist of 1-inch minimum inside diameter Schedule 40 PVC pipe.
- C. Maximum screen size shall be 0.020-in unless otherwise approved by the Engineer.

## 2.03 MONITORING POINTS

- A. Establish system of control points and monitor in accordance with the requirements herein.
1. Surface Monitoring Points (SMPs)
    - a. SMPs shall be used to monitor vertical deformation at or near the ground surface. Clearly identify all points with permanent, easily readable letters and numbers as approved by the Engineer.
    - b. Provide SMPs in paved areas consisting of a 2-inch-long masonry nail, manufactured from hardened zinc-plated steel. Drive the masonry nail into an asphalt covered surface. Identify each nail individually with an identification tag or surface marking.
    - c. Provide SMPs in non-paved areas consisting of a 3-ft-long, 3/4-inch diameter steel rod. Drive the rod into the ground or set in concrete in the ground such that no more than 3 inches of the rod is exposed above the ground surface. Round the top of the rod and punch-marked it at its center. Identify each rod with a surface marking.
    - d. Provide SMPs on utility manholes consisting of an observable cross mark or welded bead on the top horizontal surface of utility manhole rims. Clean the surface within 3 inches of the point and mark it to permit easy

identification of the exact point. Clearly identify the point shall using fluorescent spray paint adjacent to the point.

2. Excavation Support Monitoring Points (ESMPs)
  - a. ESMPs shall be fixed markers on the vertical elements of the excavation support system and shall be used to monitor horizontal deformation of excavation support system designed by the Contractor. Clearly identified all points with permanent easily readable letters and numbers as approved by the Engineer. Surface within 3 inches of each point shall be cleaned and clearly identified using fluorescent spray paint adjacent to the point.
- B. Non-Shrink Cement Grout shall be suitable for intended application.

## 2.04 SEISMOGRAPHS

- A. Provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities as specified herein. Provide for full-time use on the project during vibration causing construction activities. Provide two (minimum) seismographs which have been calibrated within the previous six months to a standard that is traceable to the National Institute of Standards and Technology. Required characteristics of seismographs are listed below:
  1. Measure the three mutually perpendicular components of particle velocity in directions vertical, radial, and perpendicular to the vibration source.
  2. Measure and display the maximum peak particle velocity continuously during vibration-generating activities.
  3. Have a low frequency omnidirectional transducer for measuring air blast overpressure with a flat frequency response within the limits of 2 Hz to 250 Hz with a tolerance equal to or better than plus or minus 10 percent.
  4. Seismic range: 0.01 to 4 inches per second with an accuracy of plus or minus 5 percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz, and with a resolution of 0.01 inches per second or less.
  5. Acoustic range: 110 to 140 dB (referenced to 20 micro-Pascals) with an accuracy and resolution of plus or minus 1 dB.
  6. Frequency response (plus or minus 3 dB points): 2 to 200 Hertz.
  7. Two power sources: internal rechargeable battery and charger and 115 volts AC. Battery must be capable of supplying power to monitor vibrations continuously for up to 24 hours.
  8. Self-triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, peak overpressure, frequencies of peaks.

9. Continuous monitoring mode must be capable of recording single-component peak particle velocities, and frequency of peaks with an interval of 1 minute or less.

## 2.05 CRACK MONITORS

- A. Provide crack gages for monitoring the width of existing cracks and joints as manufactured by Geokon, Inc., Lebanon, NH Model 4420, or equal.
- B. Crack gages shall have threaded anchors with ball joints which can be grouted to each side of the crack in any orientation and a transducer with a range of at least 1 inch and an accuracy of less than 0.1 percent and a nonlinearity of no more than 0.5 percent. The gage shall be capable of operating in temperatures ranging from minus 20 degrees to 80 degrees (Celsius).
- C. Provide a solid steel cover over each gage which does not touch or otherwise interfere with the operation of the gage.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Prior to commencing any demolition, installation of excavation support, excavation for both open trench and trenchless crossings, micropile installation and dewatering work, furnish components of instrumentation that are to be installed during construction and conduct pre-construction surveys.
- B. Install instruments.
- C. Protect from damage and maintain instruments installed by the Contractor.
- D. Repair or replace damaged instruments furnished by the Contractor.
- E. Collect, reduce, process, plot and report monitoring data obtained by survey, seismograph data, groundwater levels, and submit to the Engineer.
- F. Coordinate with the Engineer to verify consistency of collected data.
- G. Implement remedial measures based on interpretations of monitoring data program.

### 3.02 GENERAL REQUIREMENTS

- A. Perform a pre-construction survey prior to any dewatering, excavation, trenchless crossings, demolition, installation of micropiles or installation of excavation support.
- B. Install instruments at locations selected by the Contractor and approved by the Engineer in accordance with the approved installation procedures. The Engineer may modify instrument locations depending on field conditions and monitoring objectives. Install all instrumentation in accordance with the approved installation schedule.

Instruments shall be installed and baseline data, acceptable to the Engineer, shall be obtained before construction starts.

- C. Provide the Engineer with access to instrument locations and assistance required in obtaining monitoring data.
- D. Existing Conditions: Locate conduits and underground utilities in all areas where wells are to be drilled and installed. Conduct utility clearance and contact utility companies prior to any drilling. Instrument locations shall be modified, as approved by the Engineer, to avoid interference with the existing conduits and utilities. Repair damage to existing utilities resulting from instrument installations at no additional cost to the Owner.
- E. All instruments shall be clearly marked, labeled, and protected to avoid being obstructed or otherwise damaged by construction operations or the general public. Immediately following installation, the location of the top of all instruments shall be surveyed to provide horizontal and vertical coordinates. Resurveying shall be done as required by the Engineer if there is a question regarding the instrumentation location.
- F. A unique instrument identification number shall be assigned to each instrument and each point. The instrument identification number shall be clearly marked on each instrument in a non-destructible manner.
- G. Drilling from the Ground Surface: Obtain necessary permits for each such instrument and conform to the permit requirements during drilling and installation.
- H. Initial Reading: Immediately following instrument installation, the Contractor, in the presence of the Engineer, shall take two sets of initial readings to provide baseline readings and to demonstrate the adequacy of the completed installation.
- I. Factory Calibration: A factory calibration shall be conducted on all instruments at the manufacturer's facility prior to shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number.
- J. The instrumentation and monitoring specified here is considered the minimum required. The Contractor shall obtain additional data from the instrumentation and /or furnish, install, and monitor additional instrumentation as necessary to adequately monitor construction performance and safety aspects of the work.

### 3.03 MONITORING POINTS

- A. Monitoring Points shall include but not be limited to SMPs and ESMPs. Monitor these control points using surveying methods.
- B. Install SMPs as described below near excavations, trenchless crossing locations, pier installation locations, demolition and open trench locations. Additional SMPs may be required by the Engineer.
- C. SMPs shall also be installed in the pavement or ground surface, within 5 feet, along each side of trench excavations that is within 50 feet of structures. The SMPs shall be

installed at spacing not more than 50 feet. Locations may be modified to meet site constraints with the approval of the Engineer.

- D. SMPs shall also be installed on the rim of manhole covers of utilities located within 30 ft of open excavations.
- E. Along trenchless crossing alignments, SMPs shall be installed at intervals of not more than 25 feet over the proposed trenchless crossing locations in rows of three; one directly above the alignment and the other two located 10 feet apart on each side oriented perpendicular to the pipe alignment. Locations may be modified to meet site constraints with the approval of the Engineer.
- F. ESMPs shall be installed on excavation support systems other than trench box along support walls at a spacing of not more than 25 feet at launch and exit shafts for trenchless crossing.
- G. Install and obtain SMP monitoring point readings prior to demolition, installing excavation support, beginning excavation or operation of groundwater control system or start of pile installation at the site. Install ESMPs prior to excavation within the excavation support system. The Contractor shall obtain two sets of measurements for each monitoring point to establish the baseline data within three days of installation. These measurements shall be made at least 24 hours apart but not more than 48 hours apart. Monitoring points with initial surveyed elevations (or offsets as appropriate) differing by more than 0.1 inch shall be checked for secure installation and resurveyed.
- H. The reading schedule of all SMPs surveyed shall be daily during excavation, dewatering, filling and backfilling, pier installation, trenchless excavation and excavation support installation by all methods within 50 feet of the work and then at least twice a week until all excavation, dewatering and backfill is completed.
- I. The reading schedule of ESMPs shall be at least daily during associated excavation and twice a week until backfill is completed.

### 3.04 VIBRATION MONITORING

- A. Seismograph readings shall be taken during pile installation, support of excavation installation and other ground vibrations including excavation support installation or other activities causing ground vibrations within 50 feet of existing structures and railroad to document that peak particle velocities do not exceed the limit criteria as described below.
- B. Seismographs shall be installed by the Contractor near existing structures or railroad when vibratory or impact hammers are used for the installation of shoring within 50 feet of existing structures, and as directed by the Engineer.

### 3.05 GROUNDWATER OBSERVATION WELLS

- A. The screened interval of each well shall be set to monitor groundwater levels.



- B. Using approved drilling methods, drill 4-in minimum diameter holes for observation wells of the size and depth required, and case with temporary casing. Bentonite drilling mud shall not be used in drilling holes for the observation wells.
- C. Flush all cased holes with clean water through an approved bit. Flush until the discharge water is free of soil particles.
- D. Construct observation well with 10 feet of slotted PVC well screen, filter sand, bentonite seal, couplings, a pipe cap, and a locking cover.
  - 1. Place two feet of filter sand in the bottom of the drilled hole; then place the well screen and surround it with filter sand, as the temporary casing is carefully withdrawn.
  - 2. Insert solid PVC casing and cap and fill the annular space with bentonite pellets then non-shrink cement grout.
  - 3. Protect the observation wells at ground surface by providing a roadway box or outer protective casing with lockable top and padlock. Design the surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.
    - a. Provide two keys for each padlock to the Engineer for access to each well.
    - b. Observation wells shall be developed so as to provide a reliable indication of groundwater levels. Wells shall be re-developed if well clogging is observed, in the event of apparent erroneous readings, or as directed by the Engineer.
    - c. Submit observation well installation logs, top of casing elevation, and well locations to the Engineer within 24 hours of completion of well installation.
- E. Observation Well Maintenance
  - 1. The Contractor shall maintain each observation well until adjacent structures and pipelines are completed and backfilled. Clean out or replace any observation well which ceases to be operable before adjacent work is completed.
  - 2. It is the Contractor's obligation to maintain observation wells and repair or replace them at no additional cost to the Owner, whether or not the observation wells are damaged by the Contractor's operations or by third parties.
- F. Monitoring and Reporting of Observation Well Data
  - 1. The Contractor shall begin daily monitoring of groundwater levels in work areas prior to initial operation of drainage and dewatering system. Daily monitoring in areas where groundwater control is in operation shall continue until the time that adjacent structures and pipelines are completed and backfilled and until the time that groundwater control systems are turned off.
  - 2. The Contractor is responsible for processing and reporting observation well data to the Engineer on a daily basis. Data is to be provided to the Engineer on a form, which should include the following information: observation well number, depth

to groundwater, top of casing elevation, groundwater level elevation and date and time of reading.

- G. Following construction, abandon new observation wells as directed by the Engineer. Abandon observation wells by removing all material within the original borehole, including the casing, filter, and grout seal in accordance with all applicable permits. Using approved tremie methods completely fill the hole and all voids with non-shrink cement grout prior to removal of the drill casing such that formation materials do not move into the hole prior to grouting. Restore the ground surface to its original condition. Abandon wells within paved areas by removing the vaults and well caps to the pavement subgrade. Remove wells with as discussed above and repair or patch pavement with the same surface type.

### 3.06 INSTRUMENT PROTECTION, MAINTENANCE AND REPAIR

- A. Protect the instruments from damage. The Contractor shall immediately replace, within 72 hours of damage, any instrument that becomes damaged or is destroyed for whatever reason at no additional cost to the Owner. If necessary, the Contractor will suspend work in the areas being monitored by the damaged instrument and take remedial action.
- B. Maintain the instruments by draining water and flushing debris from under protective covers and keeping covers locked and sealed at all times.

### 3.07 MONITORING

- A. The Contractor shall collect, tabulate, plot and interpret the survey monitoring data and provide the Engineer with the tabulated and plotted data. Report the status of excavation, bracing, groundwater levels, micropile installation operation, stationing of the tunnel face and backfilling at the time of data collection with each report.
- B. Monitoring frequency may be modified as directed and approved by the Engineer.
- C. Provide data from readings of all monitoring points to the Engineer within 24 hours of reading. Communicate verbally with the Engineer immediately after visual observations or data collection if excessive movements or other anomalies are indicated.
- D. For seismograph data, a summary report with event summary of peak particle velocity and frequency shall be provided. A strip chart indicates the time and magnitude of maximum single-component peak particle velocity measured during each 5-minute interval of the monitoring period shall be submitted. A summary of vibration producing activities for that week shall be listed along with any specific events which caused anomalous readings.
- E. The Contractor shall make visual observations of ground conditions and building conditions in the vicinity of the site and communicate immediately with the Engineer if signs of ground or structure movements are observed.
- F. The Engineer may take independent instrumentation measurements. Cooperate with the Engineer during instrumentation monitoring by providing access to the instrumentation locations in a timely manner and by providing and maintaining safe

means of access to all instrumentation locations for data collection. Data acquired by the Engineer will be made available to the Contractor in a timely manner.

- G. The Contractor may make his/her own interpretations of monitoring data for his/her own purposes. Data or interpretations shall not be published or disclosed to other parties without advance written permission of the Owner.
- H. If the Contractor collects data from an instrument that has been installed to replace a damaged instrument, the formal initial reading for the damaged instrument shall be used as an initial reading for the replacement instrument so that data are plotted continuously, without an offset at the time of damage. The time of damage and replacement shall be noted on the plot.

### 3.08 INTERPRETATION AND RESPONSE VALUES

- A. The Contractor shall make its own interpretations of the data resulting from monitoring programs.
- B. Threshold and Limiting Values for instruments:

<u>Instrument</u>	<u>Threshold Value</u>	<u>Limiting Value</u>
Seismographs	1.0 in/sec over 40 Hz 0.75 in/sec at 30- 40 Hz 0.5 in/sec at 20-30 Hz 0.25 in/sec under 20 Hz	2.0 in/sec over 40 Hz 1.5 in/sec at 30- 40 Hz 1.0 in/sec at 20-30 Hz 0.5 in/sec under 20 Hz
Surface Monitoring Points	0.5 inch	1.0 inch
Excavation Support Monitoring Points	3/16 inch	3/8 inch
Observation Wells	2 ft below bottom of excavation or trenchless crossing	at bottom of excavation or trenchless crossing

- C. These values are subject to adjustment by the Engineer as indicated by prevailing conditions and/or circumstances.
- D. If a Threshold Value is reached:
  1. Engineer and Contractor shall meet to discuss remedial measures.
  2. Contractor shall increase the instrument monitoring frequency as directed by the Engineer.
  3. Contractor shall install and monitor additional instruments as directed.
  4. Contractor shall implement the remedial measures in the event the Threshold Value is reached, so the Limiting Value is not reached.

- E. Contractor to take all necessary steps so that the Limiting Value is not exceeded. Contractor may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid exceeding the Limiting Value.

### 3.09 DISPOSITION OF INSTRUMENTS

- A. Monitoring Points and Crack Gages: All monitoring points and crack gages shall be removed during the cleanup and restoration work, unless directed otherwise by the Engineer.
- B. Observation Wells: When required by the Engineer, abandon and remove protective housings and caps in accordance with the required permits. All surfaces affected by installation of instruments shall be restored to their original condition prior to completion of work.
  - 1. Leave in place any casings located within the plan limits of structures or pipelines or within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.
  - 2. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with non-shrink cement grout and cut off a minimum of 3-ft below finished ground level or 1-ft below foundation level so as not to interfere with finished structures or pipelines.
  - 3. Following backfilling, remove precast boxes or vaults and reconstruct pavement in paved areas. Restore surface to the conditions existing prior to installation of the instruments.
- C. Seismographs: Units shall be returned to the Contractor following completion of the demolition, pier installation, installation of excavation support and excavation.

END OF SECTION

## PART 1 GENERAL

### 1.01 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals required to perform clearing and grubbing as shown and specified in the Contract Documents.
2. The Work includes cutting, removing, and disposal from the Site trees, stumps, brush, roots, shrubs, vegetation, logs, rubbish, and other objectionable material.
3. Pay all costs associated with transporting and disposing of debris resulting from clearing.
4. Limits of Clearing and Grubbing Work: Clear and grub all areas within the Work areas unless otherwise shown or indicated in the Contract Documents.

B. Related Sections:

1. Section 01 13 00, Control of Work.
2. Section 01 57 13, Erosion and Sedimentation Control.
3. Section 02 41 00, Demolition.

### 1.02 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with Laws and Regulations for environmental requirements, disposal of debris, burning debris on Site, and use of herbicides.
2. Coordinate clearing work with Utility Companies.

### 1.03 SUBMITTALS

A. Action Submittals: Submit the following

1. Shop Drawings:
  - a. Plan for removing trees and other large vegetation not explicitly shown or indicated for removal in the Contract Documents.
  - b. Plan showing proposed limits of clearing and grubbing, if different from clearing and grubbing limits shown or indicated in the Contract Documents.

## 1.04 WARRANTY

- A. Warrant that Work performed under this Section will not permanently damage trees, shrubs, turf, and plants designated to remain, or other adjacent work, facilities, or property. If damage resulting from CONTRACTOR's operations becomes evident during the correction period, replace damaged items and property at no additional cost to OWNER.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Protection:

1. Throughout the Project, protect existing site improvements, including streets, drives, and Underground Facilities to remain (if any), and adjacent property and structures. Repair damage caused by CONTRACTOR to original condition or replace in kind, to satisfaction of ENGINEER, at no additional cost to OWNER.
2. Protect trees, shrubs, vegetation, and grassed areas to remain by providing temporary fencing, barricades, wrapping, or other methods shown, specified, or accepted by ENGINEER. Correct at CONTRACTOR's expense damage caused by CONTRACTOR outside the limits of clearing Work.
3. Do not remove trees without approval of ENGINEER, unless shown or indicated for removal.
4. Do not locate construction equipment, stored materials, or stockpiles within drip line of trees and vegetation to remain.

B. Site Preparation:

1. Obtain, pay costs associated with, and comply with applicable permits required for clearing and grubbing Work.
2. Delineation of Clearing and Grubbing Limits:
  - a. Locate and clearly flag trees and vegetation to remain, and other materials to remain in the clearing and grubbing limits. Locate and clearly flag salvable vegetation to be relocated.
  - b. Provide flagging to delineate limits of areas to be cleared or grubbed. Review at Site with ENGINEER before commencing removal of trees, vegetation, and other materials to be removed.
  - c. Replace flagging that is lost, removed, or destroyed, until clearing and grubbing Work is complete and ENGINEER allows removal of flagging.
3. Erosion and Sediment Controls:
  - a. Provide applicable erosion and sediment controls before commencing clearing and grubbing Work.

- b. Comply with erosion and sediment control requirements of Section 01 57 13, Erosion and Sedimentation Control.
- c. Continue providing erosion and sediment controls as clearing and grubbing Work progresses to previously uncleared, ungrubbed areas of the Site.

### 3.02 CLEARING AND GRUBBING

- A. Clearing and grubbing shall be performed along the project at the locations designated on the drawings or directed by the Engineer.
- B. Conduct his operations in a manner to prevent limb, bark, or root injuries to trees, shrubs, or other types of vegetation that are to remain growing and also to prevent damage to adjacent property.
- C. Exercise extreme caution in order not to clear and grub areas outside of the limits of disturbance.
- D. Remove and dispose of all trees, shrubs, stumps, roots, brush, tree laps, logs, rubbish, undergrowth, and debris within limits of clearing and grubbing shown or indicated in the Contract Documents, or as required by the project, unless otherwise shown or indicated.
- E. Any areas of growth or individual trees which are to be preserved due to their desirability for landscape or erosion control purposes will be designated on the drawings or by the ENGINEER.
- F. Where designated on the drawings individual trees shall be limbed-up, cut into six foot lengths, and stacked outside of the construction right-of-way, as directed by the Engineer, for removal by the property owner.
- G. Any surface rocks or boulders larger than 6-in in diameter shall be removed from the site.
- H. Maintenance of cleared and grubbed areas include:
  - 1. Clean-up of overgrown areas.
  - 2. Continuous weeding, brush cutting, and pruning for all areas within the contract site that has been cleared and/or grubbed. This shall take place from the Notice to Proceed until the final approval of the contract. This work is to be accomplished regardless of the phase of work in progress or any delays caused by weather, utilities, or property acquisitions.
  - 3. CONTRACTOR is to provide for bush-hogging or weed-eating certain areas within the public access or easements that have become overgrown as directed by the ENGINEER. This includes any staging areas being used by the CONTRACTOR for the duration of the contract.
- I. Trees and shrubs to remain shall be protected, and trimmed where required.

1. Trees and shrubs to remain that have been damaged or require trimming shall be treated and repaired under the direction of a qualified arborist, or other professional with qualifications acceptable to ENGINEER. Trees and shrubs intended to remain, that are damaged beyond repair or that are removed, shall be replaced by CONTRACTOR at no additional cost to OWNER.

J. Salvable Vegetation:

1. Trees, shrubs, and other vegetation requiring removal to facilitate the Work, and that will be transplanted elsewhere at the Site, shall be carefully balled and burlapped or placed in temporary pots, and stored at the Site in an acceptable area. Work involving removing and relocating trees, shrubs, and other vegetation shall be under the direction of qualified arborist acceptable to ENGINEER, or other professional acceptable to ENGINEER, hired by CONTRACTOR.

K. Disposal of Cleared and Grubbed Materials:

1. Dispose at appropriate off-site location trees, stumps, rubbish, debris, and other cleared and grubbed material. Do not use cleared or grubbed material as fill, backfill, or in embankments.
2. Dispose of cleared and grubbed material in accordance with Laws and Regulations.
3. Do not burn clearing debris at the Site, unless approved by OWNER and authorities having jurisdiction. If burning is permitted, comply with requirements of authorities having jurisdiction and Laws and Regulations. If burning is permitted at the Site, also comply with OWNER's requirements. The authority to burn does not relieve CONTRACTOR of any damages which may result from contract operations.
4. Disposal of debris on private property shall be prohibited without authorized consent.

L. Removal of site improvements, such as existing utilities (ex. Manholes), shall comply with Section 02 41 00, Demolition.

M. Roadways, streams, and access to existing operations shall be kept clear of debris.

N. CONTRACTOR shall be responsible for compliance with all Federal, State, and Local regulations.

### 3.03 TOPSOIL REMOVAL

A. Existing topsoil to be removed is defined as friable, clay loam, surface soil present in depth of at least four inches. Topsoil shall be free of subsoil, clay lumps, stones, and other objects over two-inch diameter and other objectionable material.



- B. Stripping:
1. Strip topsoil to depths encountered, in manner that prevents intermingling of topsoil with underlying subsoil or other objectionable material. Remove heavy growths of grass and vegetation from areas before stripping.
  2. Do not strip topsoil from within drip line of each tree to remain as part of the completed Project.
- C. Stockpile topsoil in storage stockpiles in areas shown, or where otherwise accepted by ENGINEER. Construct storage piles so that surface water drains freely. Stabilize large topsoil piles with a cover crop and mulch, and provide silt fencing around perimeter of pile to prevent topsoil erosion and sedimentation; silt fencing shall be in accordance with Section 01 57 13, Erosion and Sedimentation Control. Cover smaller topsoil stockpiles, when used, with reinforced fabric to prevent windblown dust. Topsoil in excess of the quantity required for the finished Project shall remain property of OWNER.

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## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. All excavation, trenching and related sheeting, bracing, etc., shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and all associated State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- B. Furnish all labor, materials, equipment and incidentals required and perform all earthwork, which includes clearing and stripping, procurement of fill material (on-site and imported), excavating, placing, and compacting fill and backfill, structural excavating and backfilling, transportation and storage of excess earthwork materials; disposal of unsuitable, waste and surplus materials, restoration of excavation and trench surfaces, and all subsidiary work necessary to complete the grading of the developed areas to conform with the lines, grades, and slopes as shown on the Drawings and as specified herein.
- C. The work shall include, but not necessarily be limited to; excavation and backfill for structures, foundations, manholes, pipes, paving; embankments; grading; and all related work such as sheeting, bracing and dewatering.
- D. Provide the services of a licensed professional engineer registered in the State of Tennessee, to prepare temporary excavation support system, and dewatering system designs and submittals in accordance with Sections 31 75 01 and 31 23 19, respectively.
- E. Furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to ensure the safety of personnel and protect adjacent structures, piping, etc., in accordance with Federal, State and local laws, regulations and requirements. Temporary excavation support systems shall be in accordance with Section 31 75 01.
- F. Furnish and install temporary dewatering and surface water control systems and operate to dewater and maintain excavations in a dry condition. Control drainage into excavations and remove seepage water and rainwater. Dewatering and surface water control shall be in accordance with Section 31 23 19.
- G. Examine the site and review the available geotechnical data prior to submitting their proposal, taking into consideration all conditions that may affect his work. The Owner and Design Engineer do not assume responsibility for variations of subsurface conditions at locations other than places shown and at the time the investigations were made.
- H. No extra work shall be initiated without notification to the Engineer and Owner in writing and the written approval of the Owner in response.
- I. Wherever the requirement for compaction is referenced to herein, it shall mean minimum percentage of maximum density as determined by ASTM D698.

- J. Protect existing structures and utilities to remain.

## 1.02 RELATED WORK

- A. Erosion and Sedimentation Control is included in Section 01 57 13.
- B. Geotechnical Instrumentation is included in Section 31 09 00.
- C. Clearing and Grubbing is included in Section 31 11 00.
- D. Dewatering and Drainage is included in Section 31 23 19.
- E. Trenching, Backfilling and Compaction is included in Section 31 23 33.
- F. Excavation Support and Protection is included in Section 31 75 01.
- G. Landscaping is included in Section 32 90 10.

## 1.03 SUBMITTALS

- A. Submit, in accordance with Section 01 33 23, the proposed methods of construction, including earthwork operations, excavation limits, slopes, fill material moisture conditioning and handling, compaction equipment, backfilling and filling and compaction for the various portions of the work, and material sources for the various portions of the work. Contractor shall remain responsible for adequacy and safety of construction means, methods, and techniques.
- B. Submit laboratory test results for all fill materials (maximum density, gradation, Atterberg limits, sand equivalent, etc., as applicable) at least 72 hours prior to importing or placing any fill.
- C. Submit for the Engineer's review and approval, the qualifications of the entity proposed to conduct geotechnical observation, testing and documentation. The submittal shall include qualifications of the firm and the resumes of the soil technician(s) assigned to the project and the licensed geotechnical engineer in charge. The firm's qualifications shall meet ASTM D3740. The soil technician shall have minimum three (3) years demonstrated experience in earthwork and grading operations and satisfy the certification requirements of agency having local jurisdiction. The Engineer reserves the right to request substitution of soil technician(s) assigned to field work. Assigned soil technician(s) shall not be substituted without the prior approval of the Engineer.
- D. Submit copies of field daily reports by the soil technician at the end of each work day while earthwork and grading operations are underway.
- E. Upon completion of earthwork and grading operations, submit a plan showing the density test numbers and locations, a table of all density test results and depths, and a certification of compliance by the geotechnical engineer in charge.

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## 1.04 REFERENCE STANDARDS

### A. ASTM International:

1. ASTM C33 – Standard Specification for Concrete Aggregates.
2. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft<sup>3</sup> (600 kN-m/m<sup>3- 3. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- 4. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- 5. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soil.
- 6. ASTM D6913 - Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
- 7. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).</sup>

### B. United States Department of Labor – Occupational Safety and Health Administration (OSHA):

1. OSHA 29 CFR Part 1926 Subpart P.

### C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 DEFINITIONS

- A. Percent Compaction: Required in-place dry density of the material, expressed as a percentage of the maximum dry density of the same material, as determined in the laboratory by ASTM Test Method D698.
- B. Optimum Moisture Content: Moisture content (percent by dry weight) corresponding to the maximum dry density of the same material as determined by ASTM Test Method D698.
- C. In-the-Dry: An excavation subgrade, where the groundwater level has been lowered to at least 2 feet below the lowest level of the excavation, stable with no ponded water, mud, or muck and shall be able to support construction equipment without rutting or disturbance and shall be suitable for the placement and compaction of fill material, pipe or concrete foundations.
- D. Structures: Buildings, manholes and below grade vaults, pipelines and utilities, pavements, and slabs-on-grade both above and below ground.

- E. Unsuitable Soil: Includes existing fill materials, organic soils, weak native soils, or clays with a plasticity index of greater than 15.
- F. Objectionable Material: Includes topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches in maximum dimension.
- G. Overexcavation: Removal of Unsuitable Soil or Objectionable Material at or below the normal grade of the excavation or subgrade as indicated on the Drawings.
- H. Subgrade: Required surface of subsoil, borrow fill or compacted fill. This surface is immediately beneath site improvements, especially dimensioned fill, paving, or other surfacing material.
- I. Finished Grade: Required final grade elevation indicated on the Drawings. Spot elevations shall be precedent over proposed contours.
- J. Coverage: Pass of compaction equipment over the complete surface area of exposed lift or subgrade to receive compaction.

## 1.06 STATUTORY REQUIREMENTS

- A. All excavation, trenching, sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P). Where conflict between OSHA, State and local regulations exists, the most stringent requirements shall apply.
- B. Three working days prior to starting any excavation, the Contractor shall notify the regional notification centers for underground utilities and underground utility owners who are not members of the notification centers.

## 1.07 PROTECTION

- A. All existing facilities which include but are not limited to structures, utilities, tanks, pavements, sidewalks, curbing, driveway aprons, fencing, landscaping and other improvements in the vicinity of the Contractor's operations shall be adequately protected. If necessary, curbing, driveway aprons and fencing shall be removed and restored or replaced after backfilling. All existing facilities damaged by the construction shall be replaced with material fully equal to that existing prior to construction to the satisfaction of the Owner.
- B. Design, furnish, install, monitor and maintain excavation support as required and as specified in Section 31 75 01.
- C. Furnish, install, monitor and maintain geotechnical instrumentation as required and as specified in Section 31 09 00.
- D. Furnish, install, monitor and maintain dewatering and drainage systems as required and as specified in Section 31 23 19.

- E. Excavations within the zone of influence of any existing structures or utility will require the use of excavation support system as specified in Section 31 75 01. The zone of influence is defined as a line extending at least 2 feet beyond of edge of the foundation, then outward and downward at a slope of 1 horizontal to 1 vertical. No excavation below the foundation of existing structures is allowed.
- F. Excavations below the level of the base of any adjacent foundation or retaining wall shall not be permitted unless the design of the excavation and bracing includes an analysis of the stability of the structure supported by the foundation and as necessary, incorporates required bracing / underpinning of the foundation.

## 1.08 QUALITY ASSURANCE

- A. At all structures, prior to the placement of bedding material, concrete work mats, structural fill or structural concrete, coordinate with Contractor's Quality Control Laboratory (QCL) to verify the suitability of the existing subgrade soil.
- B. Prior to and during the placement of backfill and fill coordinate with Contractor's QCL to perform in-place soil density tests to verify that the backfill/fill material has been placed and compacted in accordance with the compaction requirements specified elsewhere. At least 48 hours-notice shall be provided prior to placement of backfill and fill.
- C. Subgrades shall not be covered with fill nor fill placed without the observation, testing, and approval by Contractor's QCL. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer at no expense to the Owner.
- D. Materials will be tested and observed as described in the following paragraphs. Cooperate by allowing free access to the work for selection of test materials and observations.
  - 1. Materials to be used in the work shall be tested by a certified independent laboratory, engaged by the Contractor and acceptable to the Engineer, to demonstrate conformance with the requirements of these Specifications. Such testing will be paid for by the Contractor. Deliver test reports and material certifications to the Engineer before using any material in the work.
  - 2. If field test results are not in conformance with the requirements of these Specifications, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer and costs of re-testing after correction of deficiencies shall be borne by the Contractor.
  - 3. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer at no expense to the Owner.
  - 4. Testing methods shall comply with the latest applicable ASTM or equivalent AASHTO Standards specified.

5. During the placement of bedding, backfill and fill, the Contractor shall perform in-place soil density testing to confirm that fill material has been compacted in accordance with the requirements of this Section. The Engineer may designate areas to be tested. Contractor shall notify Engineer at least 72 hours in advance of scheduled compaction testing. In place soil density tests on backfill/fill material shall be as required by City, State, or Federal Codes, the project geotechnical report, but in no instance, shall be less than those listed below:
    - a. Structures and Embankments. At least one density and moisture content test for each 2,500 square feet of surface area for each lift of fill at embankment, structure and manhole locations
    - b. Trench Excavations. At least one nuclear density and moisture content test shall be conducted at a maximum of 50-ft intervals for each lift of fill placed or as directed by the Engineer. Refer to Section 31 23 33 Trenching, Backfilling and Compaction.
    - c. The Engineer may designate additional areas to be tested.
  6. Materials which have been previously tested may be subjected to further testing from time to time and may be rejected if it is determined that they do not conform to the requirements of these Specifications. Rejected materials shall be removed from the work immediately when so directed by the Engineer, notwithstanding the results of previous testing.
- E. The Engineer or Owner may conduct additional soil testing. Cooperate fully in obtaining the information desired and allowing free access to the work.

## 1.09 CONSTRUCTION CONTROL

- A. The Contractor is responsible for all construction layout and reference staking necessary for the proper control and satisfactory completion of all structures, cutting, filling, grading, drainage, fencing, embankment improvements, curbing, and all other appurtenances required for the completion of the construction work and acceptance of the Contract as specified and as shown on the Drawings.
- B. All construction layout and staking shall be performed by a professional land surveyor or professional engineer registered in State of Tennessee, experienced and skilled in construction layout and staking of the type required under this Contract, and acceptable to the Engineer and Owner.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Common Fill - Common fill shall be approved, on-site excavated material or imported fill material that is composed of durable soil free of debris, organic matter, or other deleterious materials. Common fill shall not contain stones larger than 6 inches in largest diameter, a maximum of 75 percent passing the No. 200 sieve, and a maximum dry density of at least 90 pounds per cubic foot (pcf) as determined by ASTM D 698. Common fill shall not contain granite blocks, broken concrete, masonry rubble, or other similar materials and shall have physical properties such that it can be readily spread and compacted during filling.



- B. Select Common Fill – Select common fill shall be as specified above for common fill except that the material shall contain no stones larger than 2 inches in largest diameter.
- C. Structural Fill – Structural fill shall consist of mineral soil free of organic material, loam, debris, frozen soil or other deleterious material which may be compressible, or which cannot be properly compacted. Structural fill should consist of materials with the following gradation:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3-in	100
No. 4	20 to 90
No. 40	5 to 75
No. 200	0 to 50

Structural fill should have a maximum liquid limit of 50 percent, maximum plasticity index of 15 percent, and a maximum dry density of at least 95 pcf as determined by ASTM D698.

- D. Crushed Stone – Crushed stone shall conform to No. 57 stone of the Tennessee Department of Transportation (TDOT) Standard Specifications for Roads and Bridges, latest edition and all addenda and supplements thereto.
- E. Screened Gravel – Screened gravel shall be used for pipe bedding as detailed and at other locations indicated on the Drawings. Screened gravel shall conform to No. 7 stone of the TDOT Standard Specifications for Roads and Bridges, latest edition and all addenda and supplements thereto.
- F. Sand – Sand shall conform to ASTM C33 for fine aggregate.
- G. Geotextile:
1. Geotextile shall be used as necessary or where indicated on the Drawings and shall conform to the following requirements:
    - a. Minimum grab strength of 120 lbs per ASTM D4632.
    - b. Apparent opening size to be equal to or greater than the U.S. Standard Sieve No. 100 (0.210 mm) per ASTM D4751.
    - c. Percent open area not to exceed about 25 percent. The percent open area is defined as the ratio of the sum of 20 or more individual open areas (times 100) to the sum of the corresponding 20 or more individual total areas.
    - d. Coefficient of permeability shall not be less than 0.2 cm/sec.
    - e. Geotextile shall be Mirafi, Type 160N; Propex Type Geotex 1001; GSE Type NW6; or equal.

## 2.02 CONFORMANCE TESTINGS

- A. Periodic conformance testing shall be conducted by the Contractor's Quality Control Laboratory (QCL) on common, select common, and structural fill materials prior to their use on the project. The following tests shall be conducted on the common, select common, and structural fill at the indicated frequencies:

<u>Test</u>	<u>Method</u>	<u>Frequency</u>
Grain Size or change in material	ASTM D 6913	Every 4,000 cy
Atterberg Limits or change in material	ASTM D 4318	Every 4,000 cy
Moisture/Density or change in material	ASTM D 698	Every 4,000 cy
Natural Moisture or change in material	ASTM D 2216	Every 4,000 cy

The grain size conformance tests and frequencies listed above also apply to crushed stone, screened gravel, and sand and the testing shall conform to ASTM C136.

Results of the tests shall be submitted to the Engineer within 24 hours of test completion and prior to material use on the project. The Engineer reserves the right to reject material based on the results of these conformance tests and/or independent quality assurance testing conducted by the Engineer or the Owner. Rejected materials shall be removed from the site at no cost to the Owner.

## PART 3 EXECUTION

### 3.01 PREPARATION

#### A. Test Pits:

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.
2. Test pits shall be backfilled and compacted as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans.

- B. Geotechnical instrumentation shall be installed in accordance with Section 31 09 00 prior to commencing excavation work.

### 3.02 DEWATERING AND DRAINAGE

- A. Dewatering and drainage systems shall be in accordance with Section 31 23 19.

### 3.03 SUPPORT OF EXCAVATION

- A. Support of excavation shall be in accordance with Section 31 75 01.

### 3.04 EXCAVATION

- A. Excavation shall include material of every description and of whatever substance encountered. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.
- B. In general, the on-site soils can be excavated using standard earthmoving equipment. Excavation in dense soil or rock may require special equipment. In no case shall the earth be ploughed, scraped, or dug with machinery so near to the finished subgrade as to result in excavation of, or disturbance of material below grade.
- C. Excavations shall be made to the grade indicated on the Drawings and in widths sufficient for laying the pipe, construction of the structures, bracing and for dewatering and drainage facilities. Excavations for structures shall be suitably wide for construction of the structures, including excavation supports, dewatering and drainage systems and working clearances.
- D. Excavation shall be performed in the dry and shall be accomplished by methods which preserve the natural undisturbed condition of the subgrade soils.
- E. If the bottom of any excavation is taken out below the limits shown on the Drawings, specified, or directed by the Engineer, it shall be refilled at no additional cost to the Owner with structural fill, screened gravel, or lean concrete or other material satisfactory to the Engineer.
- F. When excavation has reached prescribed depths, the Engineer shall be notified and will observe the conditions. If materials and conditions are not satisfactory to the Engineer, the Engineer will issue instructions as to the procedures. The Engineer will be the sole judge as to whether the work has been accomplished satisfactorily.
- G. Subgrade soils that have become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods, in the opinion of the Engineer, shall be removed and replaced with structural fill, screened gravel, or lean concrete as acceptable to the Engineer at the Contractor's expense.
- H. Exposed subgrades in large open areas, for foundations shall be proof rolled with at least two overlapping coverages of a vibratory drum roller with a minimum of a 10-ton static drum weight. Proofrolling in confined areas may be accomplished with hand operated vibratory equipment approved by the Engineer. Proofrolling shall be conducted in the presence of the Engineer. The Engineer shall waive this requirement if, in his/her opinion, the subgrade will be rendered unsuitable by such proofrolling.
- I. Perform overexcavation at the request of the Engineer to remove Unsuitable Soil, Objectionable Material, or other materials as determined by the Engineer to such depth and width as the Engineer may direct and shall be replaced with suitable material as directed by the Engineer.
- J. Excavation for all pipes, structures and footings shall be carried out with the excavating equipment operating from the subgrade for the structure. The excavation shall be carried out "in the dry" and in a manner which will preserve the undisturbed state of the subgrade soils.

- K. When excavations have reached the required subgrade, including any allowances for working mats or base materials, prior to the placement of working mats or base materials, notify the soils testing laboratory to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings. If the existing subgrade soils are determined to be unsuitable, direction will be provided by the Engineer regarding removal and replacement with suitable materials. If Contractor believes that such direction would increase Contractor's cost and would thereby entitle Contractor to a change in Contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the General Conditions pertaining to changes in the work.
- L. Overexcavation beyond the limits and depths required by the Contract Documents shall be replaced at no additional cost to the Owner by lean concrete, structural fill or other approved material subject to the prior approval of the Engineer.

### 3.05 SUBGRADE PREPARATION

- A. Maintain the excavated subgrade "in-the-dry".
- B. Prior to placement of fill, remove all objectionable material which shall include but not be limited to pavement, topsoil, organic matter, contaminated soil, construction debris, perishable materials, snow, ice, frozen earth, and rocks or lumps of cemented soils over 6 inches in maximum dimension.
- C. For subgrades consisting of granular soils, proofroll the final subgrade using at least four coverages of a vibrator plate compactor.
- D. Soft subgrades or unusable material shall be removed and replaced with compacted structural fill.
- E. During wet or freezing weather, the Contractor shall take measures to protect foundation excavations once they have been approved by the Engineer. These measures shall include, but are not limited to, placing insulation blankets, placing a layer of screened gravel, crushed stone, or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tent. If additional overexcavation is required because the subgrade was not protected against wet or freezing weather, the cost of such additional work shall be borne by the Contractor.
- F. Notify the Engineer to observe the subgrade following subgrade preparation and prior to fill placement. If the existing subgrade soils are determined to be unsuitable, direction will be provided by the Engineer regarding removal and replacement with suitable materials.

### 3.06 FILLING PLACEMENT AND COMPACTION PROCEDURES

- A. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e., topsoil, sod, etc.). Soft spots or uncompacted areas shall be corrected.

- B. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact (i.e., the in-place moisture content of the soil at that time is no more than two percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction).
- C. Structural Fill and Embankment Fill (Select Common Fill) shall be constructed to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc.). Soft spots or uncompacted areas shall be corrected.
- D. Fill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill material shall be free of snow, ice and frozen earth.
- E. All structure water-tightness tests and dampproofing/waterproofing shall be completed prior to placing fill or backfill around structures.
- F. If the subgrade slopes more than 10%, the subgrade shall be stepped to produce a stable, horizontal surface for the placement of fill materials. The existing subgrade slope shall then be scarified to a depth of at least 6-inches.
- G. Fill slopes should be compacted by slope rolling and trimming or should be overfilled and trimmed back to plan grade to expose a firm, smooth surface free of loose material.
- H. Fill lifts shall not contain stones with a dimension larger than 1/2 the specified loose measure lift thickness.
- I. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, fully loaded ten-wheel trucks or front-end loaders, tractor dozers weighing at least 30,000 lbs or heavy vibratory rollers. Compaction in confined areas (including areas within a 45-degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6 in (measured before compaction) when hand operated equipment is used.
- J. On-Site Fill Material shall be moisture conditioned prior to placement unless the Contractor demonstrates to Engineer in-place moisture conditioning methods that can achieve the required moisture content.
- K. Compaction of each specified lift of fill materials shall be conducted by a minimum of four (4) complete coverages with acceptable compaction equipment to a specified density which is expressed as a percentage of the maximum dry density as determined by ASTM D698, unless specified otherwise.
- L. Fill required beneath foundations or slabs on grade (except sidewalks) shall be structural fill. Place and compact structural fill in even lifts having a maximum thickness (measured before compaction) of 8-in.
- M. Fill and backfill material placed immediately adjacent to and within 10-ft of all structures shall be structural fill. All structure water-tightness tests and dampproofing / waterproofing shall be completed prior to placing fill or backfill around structures. Place

and compact structural fill in even lifts having a maximum thickness (measured before compaction) of 8-in uniformly around the structure.

- N. Common fill may be used in areas beyond those designated for structural fill unless shown or specified otherwise. Common fill shall be placed in even lifts having a maximum thickness (measured before compaction) of 12-in.
- O. Select common fill may be used in areas designated for embankment fill unless shown or specified otherwise. Select common fill shall be placed in even lifts having a maximum thickness (measured before compaction) of 8-in.

### 3.07 IMPERVIOUS FILL

- A. Impervious fill shall be placed in controlled, even lifts having a maximum thickness (measured before compaction) of 6-in. Compaction shall be sufficient to attain a permeability of less than  $1 \times 10^{-7}$  cm/sec.
- B. Moisture content of impervious fill to be compacted shall be maintained at or near its optimum moisture content (minus 2 to plus 2 percent).

### 3.08 COMPACTION REQUIREMENTS

- A. Perform in place testing of compacted fill lifts to measure in-place density and water content (ASTM D6938).
- B. Beneath foundations and slabs on grade (except sidewalks): Compact the top 12-in of existing subgrade (and each layer of fill if applicable) to a minimum of 98 percent maximum dry density (ASTM D698) at or near its optimum moisture content (minus 2 to plus 2 percent).
- C. 10-ft around structures: Compact each layer of fill or backfill to a minimum of 98 percent maximum dry density (ASTM D698) at or near its optimum moisture content (minus 2 to plus 2 percent).
- D. Embankments (except under roadways), lawn or unimproved areas: Compact each layer of fill or backfill to a minimum of 95 percent maximum dry density (ASTM D698) at or near its optimum moisture content (minus 2 to plus 2 percent).
- E. Sidewalks: Compact each layer of fill to a minimum of 98 percent standard proctor (ASTM D698) at or near its optimum moisture content (minus 2 to plus 2 percent).
- F. Roads, paved areas and roadway embankments: Compact each layer of fill or backfill to a minimum of 98 percent maximum dry density (ASTM D698) at or near its optimum moisture content (minus 2 to plus 2 percent).
- G. Crushed stone shall be placed in layers having a maximum thickness of 6 inches and compacted by rolling and tamping to 98% of the maximum dry density as determined by AASHTO T180 at or minus 2% of the optimum moisture content.

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### 3.09 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

- A. Unsuitable Soil, Objectionable Material, and waste and surplus excavated material shall be removed and disposed of offsite. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the work site.

### 3.10 GRADING

- A. Grading shall be performed to the lines and grades shown on the Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of. Subgrades shall be completely and continuously drained and dewatered throughout the grading process. Install temporary drains, drainage ditches, etc., to intercept or divert surface water which may affect the execution or condition of grading work.
- B. If at the time of grading it is not possible to place any material in its proper section of the Work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.
- C. In cut areas, all loose or protruding rocks in slopes shall be removed to line or finished grade of the slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Drawings unless otherwise directed by the Engineer.

END OF SECTION

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## PART 1 GENERAL

### 1.01 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to perform rock removal required for the Work, including disposing of excavated rock material.
2. Obtain permits required by authorities having jurisdiction for rock removal Work, including transporting, storing, and using blasting materials.
3. Perform rock removal Work in compliance with Laws and Regulations applicable permits, and requirements of authorities having jurisdiction.

B. Coordination:

1. Review procedures under this and other Sections and coordinate the Work that must be performed with or before rock removal.
2. Rock removal by blasting will not be permitted unless the contractor can demonstrate that no other means (pneumatic hammering, drilling, wedging, etc.) of rock removal are reasonably possible.

C. Related Sections:

1. Section 01 13 00, Control of Work.
2. Section 31 23 00, Earthwork.
3. Section 31 23 33, Trenching and Backfilling.

### 1.02 REFERENCES

A. Standards referenced in this Section are:

1. United States Bureau of Mines (USBM), Report of Investigations (RI) 8507.

### 1.03 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:

1. "Rock removal" is removal of igneous, metamorphic, or sedimentary rock or stone; boulders over two cubic yards in volume in open areas and boulders over one cubic yard in volume in trenches; and mass concrete; that cannot be removed using rippers or other mechanical methods and therefore requires

drilling and blasting or use of large excavator-mounted pneumatic breakers. The following material will not be measured nor allowed for payment as rock removal:

- a. Soft, weathered or disintegrated rock that can be removed by normal excavating equipment, including bulldozers with rippers and large trackhoes with rock teeth or rock buckets.
  - b. Loose or previously blasted rock.
  - c. Broken stone in rock fills.
  - d. Rock or stone that falls into the excavation from outside limits of excavation shown or indicated in the Contract Documents.
  - e. Boulders that can be removed without drilling, blasting, or pneumatic breakers.
  - f. Pavements, sidewalks, and gutters of concrete, asphalt, or masonry.
2. "Trenches" means excavations having vertical sides whose depth exceeds its width, made for Underground Facilities and drainage beds.

## 1.04 QUALITY ASSURANCE

### A. Qualifications:

1. Professional Engineer:
  - a. CONTRACTOR or blasting Subcontractor shall retain a registered professional engineer legally qualified to practice in Tennessee. Professional engineer shall have at least five years of experience conducting preblast surveys, structural evaluations, and structural condition assessments.
  - b. Responsibilities include:
    - 1) Preparing or supervising preparation of preblast survey.
    - 2) Preparing written requests for clarifications or interpretations of the Contract Documents for submittal to ENGINEER by CONTRACTOR.
    - 3) Signing and sealing preblast survey report.
    - 4) Performing condition assessments of structures damaged by blasting.

## 1.05 SUBMITTALS

### A. Informational Submittals: Submit the following:

1. Test and Evaluation Reports:
  - a. Blasting Plan, prepared by the blasting professional responsible for design and execution of the work. Plan shall consider existing and new structures and the potential impacts (vibration, etc.) on these structures. Plan shall also include seismograph locations.
  - b. Rock surface survey information, in accordance with Article 3.1 of this Section.
  - c. Preblast survey report, in accordance with Paragraph 3.2.D of this Section.
  - d. Blasting records, when requested by ENGINEER, in accordance with Paragraph 3.3.F of this Section.
  - e. Vibration and overpressure monitoring results, in accordance with Paragraph 3.4.A.3 of this Section.

## 1.06 MEASUREMENT AND PAYMENT

### A. Measurement:

1. Limits of rock removal shall be as follows:
  - a. Structures: Limit for all structures shall be bounded by the following:
    - 1) Bottom of footing, drainage course material, or compacted backfill.
    - 2) Pre-construction rock surface.
    - 3) Vertical planes located 12 inches outside footing.
  - b. Trenches: Limit for trenches shall be bounded by the following:
    - 1) Width of trenches shall not exceed the nominal diameter of the pipe plus 2 feet. Sides of trench shall be considered vertical.
    - 2) Depth of trench shall be 6 inches below the barrel of the pipe unless indicated otherwise on the Drawings.
    - 3) Length shall be equal to installed length of the Underground Facility, measured horizontally.
2. Trench shall be excavated 9 inches outside the exterior walls of manholes and structures.
3. The quantity of rock excavation to be paid for will be the number of cubic yards of rock measured in a rectangular prism along the vertical centerline of the trench.
4. No payment will be made for additional quantity outside the limits described in this Section.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.01 EXAMINATION

#### A. Top-of-Rock Survey:

1. Prior to blasting and rock removal, survey and measure the elevation of the top of rock to determine the in-place quantity of rock to be excavated.
2. Uncover rock to be excavated in sections or areas acceptable to ENGINEER for surveying.
3. Conform to Section 01 13 00, Control of Work.
4. Submit to ENGINEER field notes, site plan showing rock elevations measured, cross-sections of rock surface when necessary or required by ENGINEER, and detailed estimation of quantity of rock to be excavated.

### 3.02 PREBLAST SURVEY

#### A. General:

1. Preblast survey shall be performed or supervised by CONTRACTOR's or Subcontractor's professional engineer qualified in accordance with Article 1.4 of this Section.
  2. Complete preblast survey before starting blasting and rock removal.
  3. Preblast Survey Limits:
    - a. Preblast survey shall document the preblast condition, defects, and other physical factors that could reasonably be affected by blasting, of all existing residences; commercial, industrial, and institutional buildings; water supply wells; Underground Facilities and above-ground utilities; and other structures within the greater of the following distances from the limits of rock removal Work to be performed by blasting: 500 feet, or limit required in Laws and Regulations.
    - b. Preblast survey shall include structures such as dams, ponds and reservoirs, cisterns, structures of historical significance, and structures with unusually costly or vulnerable contents.
    - c. Preblast survey shall document the species and sensitivity of livestock and other animals that could be affected by blasting.
  4. If, during the Work, CONTRACTOR is requested by a property owner or tenant to view alleged damage to property, give written notice to OWNER prior to visiting to the property.
- B. Preparation for Preblast Survey:
1. Contact all owners and tenants, or their legal representative, of properties within limits of preblast survey to obtain permission to conduct preblast survey of the associated property. If property owner and tenant (if any) does not grant permission to conduct preblast survey, contact property owner and tenant (if any) a second time by registered mail (return receipt requested). Second request for permission to conduct preblast survey shall include description of preblast survey to be performed and purpose of preblast survey. At least 72 hours prior to starting blasting, provide to authority having jurisdiction, in writing, names and addresses of property owners and tenants (if any) who refuse access for preblast survey.
  2. Notify property owners and tenants at least 48 hours prior to conducting preblast survey.
  3. Not less than 48 hours before conducting blasting, submit preblast survey report as specified in Paragraph 3.2.D of this Section.
- C. Method:
1. Buildings, Structures, Underground Facilities, and Above-ground Utilities:
    - a. Include in preblast survey detailed examination of interior and exterior of structures, Underground Facilities, and above-ground utilities located within specified limits of preblast survey.
    - b. Underground Facilities: With owner of Underground Facility, document condition of access points such as chambers, manholes, and vaults.

- c. Obtain color photographs, video, and prepare sketches and written descriptions to document the condition of areas within specified limits of preblast survey. Photographs and video shall conform to Section 01 32 33, Photographic Documentation.
      - d. Document evident structural faults or deficiencies and recent repairs.
    2. Wells: Include in preblast an assessment of water supply wells located within specified limits of preblast survey, including:
      - a. Information on well's date of construction, depth, method of construction, yield, water quality, and other existing available data. Obtain information from owner of well and installer (if known).
      - b. Perform short-duration pump test on each well utilizing existing pump serving the associated well. Activate pump, measure volume of water and drawdown in the well for period of one-hour or less until approximate steady state conditions are achieved. Use data obtained from these measurements to estimate approximate yield of each well.
- D. Survey Report:
1. General: Prepare written report summarizing results of preblast survey.
    - a. Not less than 72 hours before blasting, submit two copies of completed preblast survey report to each authority having jurisdiction for their reference, if required. Submit one copy of preblast survey to OWNER, two copies to ENGINEER, and retain one copy at the Site.
    - b. CONTRACTOR's or Subcontractor's professional engineer shall sign and seal final preblast survey report.
  2. Contents: Preblast survey report shall contain the following:
    - a. Location and description of each property within or partially within the specified preblast survey limits.
    - b. Descriptions of conditions of buildings, structures, Underground Facilities, above-ground utilities, wells, and other elements included in the preblast survey.
    - c. Summary of visual observations and inspections.
    - d. Color photographs, sketches, and video as appropriate.
    - e. All data, results, and yield estimates developed from water supply well assessments.
  3. Photographic Documentation: Provide video to present supplemental information, as required. Photographic documentation shall conform to Section 01 32 33, Photographic Documentation. Include in photographs and video (where appropriate) a scale to indicate dimensions. In addition to information required in Section 01 32 33, Photographic Documentation, label photographs with name of the professional engineer responsible for preblast survey, name of property owner, and sufficient information to determine the location of the image. Include in preblast survey report one print of each photograph and include discs with video and electronic copies of photographs.
  4. CONTRACTOR's or Subcontractor's professional engineer shall report all findings that, in professional engineer's opinion, indicate that building, structure,

Underground Facility, above-ground utility, or well will be adversely affected by the rock removal and blasting Work.

### 3.03 BLASTING AND ROCK REMOVAL

- A. Perform blasting in accordance with Laws and Regulations relative to blasting, storage and use of explosives, and rock removal.
  - 1. All explosives must be in accordance with the local Building Code.
- B. Perform rock removal adjacent to Underground Facilities and above-ground utilities and life-safety facilities with utmost care, after properly notifying and coordinating with utility owners, life-safety facility owners, and authorities having jurisdiction.
- C. Perform blasting to avoid endangering persons or property, and damaging or weakening adjacent foundations, structures, sheeting, bracing, and other facilities. Cover or otherwise suitably confine blasting to prevent flyrock.
- D. Be fully responsible for injury and damage caused by blasting, and shall repair or replace all injury and damage immediately, as accepted by ENGINEER at no additional cost to OWNER.
- E. Limit Criteria for Blasting Vibration, Particle Velocity, and Airblast Overpressure:
  - 1. Amount of vibration, frequency and overpressure generated by blasting shall not exceed limits in Laws or Regulations, and limits established by authorities having jurisdiction.
  - 2. Maximum peak particle velocity (PPV) shall not exceed limits indicated in Figure B-1, Appendix B, of the USBM RI 8507 or as required based upon the results of the preblast survey, whichever is more stringent.
  - 3. Peak airblast overpressure measured at location of nearest occupied, above-ground structure (considering wind direction) shall not exceed 0.014 psi.
- F. Keep records of all blasts. Blasting records shall be kept in an orderly manner and available for inspection or submitted to the ENGINEER when requested. The following information shall be included:
  - 1. Date and time of shot.
  - 2. Foreman's name.
  - 3. Name of person conducting blasting operation.
  - 4. Location, depth, number, and diameter of drill holes.
  - 5. Depth of overburden.
  - 6. Type and amount of explosive used in each hole.

7. Type of caps used.
  8. Weather conditions.
  9. Other pertinent data.
- G. Removal by Methods Other than Blasting:
1. Where conditions of hazard exist, or clearances with existing facilities, piping, or structures are very small, where criteria herein cannot be met, or where the potential for damage to persons or property is strong, perform rock removal by means other than blasting. These methods include special techniques such as drilling, expansion chemical agents and wedging.
- H. Removal and Disposal of Rock:
1. Remove blasted or broken rock from excavations with suitable equipment in accordance with Section 31 23 33, Trenching and Backfilling.
  2. Do not use excavated rock as backfill unless it is processed to meet the requirements of specified fill and backfill materials. Dispose of excavated rock off the Site at CONTRACTOR's expense in compliance with Laws and Regulations.

### 3.04 SITE QUALITY CONTROL

- A. Blast Monitoring:
1. Perform blast monitoring in accordance with Laws and Regulations.
  2. Monitor blasting to allow evaluation of compliance with the limitations specified in the Contract Documents. At minimum, monitor each blast as follows:
    - a. Blast Monitoring Zone: Monitor vibrations at exterior walls of a minimum of two structures closest to each blast.
    - b. If no structures are located within specified blast monitoring zone, monitor vibrations at three equally spaced radial points located at perimeter of specified blast monitoring zone.
    - c. Monitor overpressures for all structures within specified blast monitoring zone.
  3. Submit vibration and overpressure monitoring results to ENGINEER within 24 hours of blasting. CONTRACTOR's monitoring does not relieve CONTRACTOR of responsibility for controlling vibration and overpressure during blasting.
- B. Post-Blast Well Monitoring:
1. Submit post blasting well monitoring reports to include pump tests and water quality as described in above section 3.2.C.2 items b and c.

### 3.05 UNAUTHORIZED ROCK REMOVAL

- A. Rock removal outside the limits shown or indicated in the Contract Documents or that is not approved by ENGINEER, including removal, disposal, and backfill, will be at CONTRACTOR's expense.
- B. Fill unauthorized excavation below pipe or foundation with compacted select backfill as directed by ENGINEER in writing, at no additional cost to OWNER. Backfill other unauthorized excavation as specified in Section 31 23 33, Trenching and Backfilling.

END OF SECTION



## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system as required to lower and control water levels at least 2-ft below pipe trench bottoms and excavation subgrades, and 2-ft below entry and exit pits and at tunnel invert elevation for trenchless crossing to permit construction to proceed in-the-dry. Deviations to requirements specified within this document must be approved by the Engineer.
- B. Design, furnish, install, operate, monitor, maintain and remove temporary surface water control measures adequate to drain and remove surface water entering excavations.
- C. Retain the services of a professional engineer registered in the State of Tennessee to prepare dewatering and drainage system designs and submittals described herein.
- D. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation required to monitor the performance of the dewatering and drainage system as required herein.
- E. Collect and properly dispose of all discharge water from the dewatering and drainage systems in accordance with the provisions of Section 01110. Under no circumstances shall water from dewatering systems be discharged into the existing or new sanitary sewer systems unless written permission of the utility or property owner is obtained.
- F. Obtain and pay for all permits required for dewatering and drainage systems.
- G. Repair damage caused by dewatering and drainage system operations.
- H. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

### 1.02 RELATED WORK

- A. Submittals are included in Section 01 33 23.
- B. Geotechnical Instrumentation is included in Section 31 09 00.
- C. Earthwork is included in Section 31 23 00.
- D. Trenching, Backfilling and Compaction is included in Section 31 23 33.
- E. Excavation Support and Protection is included in Section 31 75 01.
- F. Jacking under Railroads is included in Section 33 05 25.

### 1.03 SUBMITTALS

- A. Dewatering and drainage system designs shall be prepared by a licensed professional engineer retained by the Contractor, registered in the State of Tennessee. The Contractor shall submit an original and three copies of the licensed professional engineer's certification on the PE form specified in Section 01 33 23. The Contractor shall also submit qualifications as required herein.
- B. At least 2 weeks prior to the start of construction in areas of anticipated dewatering, the Contractor shall submit a dewatering and drainage system design plan. The plan shall include a description of the proposed dewatering system and include the proposed installation methods to be used for dewatering and drainage system elements and for observation wells. The plan shall include equipment, drilling methods, holes sizes, filter sand placement techniques, sealing materials, development techniques, the number and location of dewatering points and observations wells, etc. Include the dewatering system design calculations in the plan.
- C. The plan shall identify the anticipated area influenced by the dewatering system and address impacts (i.e., settlement) to adjacent existing and proposed structures, and provide recommended permissible drawdown at proposed observation well locations. The report shall also include detailed plans for pre-construction surveys of existing structures at the site and settlement monitoring, as well as provisions to address settlement of existing structures resulting from dewatering activities as specified in Section 33 05 25.
- D. Coordinate dewatering and drainage submittals with the Earthwork, Jacking Under Railroads and Excavation Support and Protection submittals. The submittal shall show the areas and depths of excavation to be dewatered.
- E. Do not proceed with any excavation or dewatering activities until the dewatering submittals has been approved by the Engineer.

### 1.04 QUALITY ASSURANCE

- A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.
- B. The Contractor shall have at least 5 years of experience with work compatible to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of Work.
- C. The Contractor's design engineer shall be registered in the State of Tennessee and have a minimum of 5 years of professional experience in the design and construction of dewatering and drainage systems and shall have completed not less than 5 successful dewatering and drainage projects of equal type, size, and complexity to that require for the work and acceptable to the Engineer and Owner.

## 1.05 DESIGN REQUIREMENTS

- A. The Contractor is responsible for the proper design and implementation of methods for controlling surface water and groundwater.
- B. The primary purpose of the groundwater control system is to preserve the natural undisturbed condition of the subgrade soils in the areas of the proposed excavations. Prior to excavation, the Contractor shall lower the groundwater to at least 2-ft below the lowest excavation subgrade elevation, and 2-ft below entry and exit pits and at tunnel invert elevation for the trenchless crossing. Additional groundwater lowering may be necessary beyond these requirements, depending on construction methods and equipment used and the prevailing groundwater and soil conditions. The Contractor is responsible for lowering the groundwater as necessary to complete construction in accordance with the plans and specifications at no additional cost to the Owner.
- C. Design deep wells, well points and sumps, and all other groundwater control system components to prevent loss of fines from surrounding soils. Sand filters shall be used with all dewatering installations unless screens are properly sized by the Contractor's design engineer to prevent passage of fines from surrounding soils.
- D. The Contractor shall be responsible for damage to properties, buildings or structures, sewers and other utility installations, pavements and work that may result from dewatering or surface water control operations.
- E. Design review and field monitoring activities by the Owner or by the Engineer shall not relieve the Contractor of his/her responsibilities for the work.
- F. The Contractor shall perform pre-construction surveys of facilities as specified in Section 31 09 00.
- G. As necessary, provide backup power generation and groundwater control system components and devise emergency procedures for maintaining continuous, uninterrupted surface water and groundwater control operations.
- H. The Contractor shall be responsible for meeting all permit conditions.

## 1.06 DEFINITIONS

- A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as an excavation subgrade, where the groundwater level is lowered to at least 2-ft below the lowest excavation subgrade elevation, and 2-ft below entry and exit pits and at tunnel invert elevation for the trenchless crossing, is stable with no ponded water, mud, or muck, and is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.

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## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Pipe for observation wells is specified in Section 31 09 00.
- B. Piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavations shall be suitable for the intended purpose.
- C. Standby pumping systems and a source of standby power shall be maintained at all sites.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Control surface water and groundwater such that work within the jacking casing pipe, and all excavation to final grade are made in-the-dry, the natural undisturbed condition of the subgrade soils is maintained and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.
- B. Methods of groundwater control may include but are not limited to perimeter trenches and sump pumping, perimeter groundwater cutoff, well points, ejectors, deep wells and combinations thereof.
- C. Where groundwater levels are above the proposed bottom of excavation level, a pumped dewatering system will be required for pre-drainage of the soils prior to excavation, and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged.
- D. It is expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location.
- E. All work included in this Section shall be done in a manner which will protect adjacent structures and utilities and shall not cause loss of ground or disturbance to the pipe bearing soils or to soils which support overlying or adjacent structures.
- F. Install, monitor and report data from observation wells. Evaluate the collected data relative to groundwater control system performance and modify systems as necessary to dewater the site in accordance with the Contract requirements.
- G. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with the installation and monitoring of geotechnical instrumentation. Excavations for sumps or drainage ditches shall not be made within or below 1H:1V slopes extending downward and out from the

edges of existing or proposed foundation elements or from the downward vertical footprint of the pipe without the approval of the Engineer.

- H. As necessary, provide backup power generation and groundwater control system components and devise emergency procedures for maintaining continuous, uninterrupted surface water control and groundwater control operations.

### 3.02 SURFACE WATER CONTROL

- A. Construct surface water control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water into excavations and to allow construction to proceed without delay.

### 3.03 EXCAVATION DEWATERING

- A. At all times during construction, provide and maintain proper equipment and facilities to promptly remove and properly dispose of all water entering excavations. Excavations and all work within the jacking casing pipe shall be maintained in-the-dry. Groundwater levels shall be kept at least 2-ft below the lowest excavation level.
- B. Excavation dewatering shall maintain the subgrade in a natural undisturbed condition and until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
- C. Pipe, masonry, and concrete shall not be placed in water or be submerged within 24 hours after being installed. Pipe, masonry or concrete which becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe, masonry or concrete. Water shall not flow over new masonry or concrete within four days after placement. Excavations for foundations and structures shall be maintained in-the-dry for a minimum of 4 days after concrete placement.
- D. In no event shall water rise to cause unbalanced pressure on structures. Structures shall not be subjected to uplift water pressures until the concrete or mortar has set at least 24 hours. Prevent flotation of the pipe by promptly placing backfill.
- E. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed condition of the subgrade soils at the proposed bottom of excavation.
- F. If the subgrade of the trench or excavation bottom becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by the Engineer and refill with structural fill, screened gravel or other material as approved by the Engineer at the Contractor's expense at no additional cost to the Owner.
- G. It is expected that the initial dewatering plan may have to be modified to suit the variable soil/water conditions to be encountered during construction. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures or instability of the tunnel face conditions.

- H. If the method of dewatering does not properly dewater the excavation as specified, install additional groundwater observation wells as directed by the Engineer and do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered at least 2-ft below the lowest excavation subgrade elevation, and 2-ft below entry and exit pits and tunnel inverts.
- I. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.
- J. Water entering the excavation from precipitation or surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to a sump and pumped from the excavation to maintain a bottom free from standing water.
- K. All pumping equipment shall be electric motor driven or shall have an internal combustion engine with maximum noise of 85 dBA at a distance of 10 feet from the equipment. No internal combustion engines exceeding this noise limit shall be used between the hours of 5:00 p.m. and 8:00 a.m. The Contractor shall provide connections to a commercial power supply for electric motor-driven pumps or shall use generators meeting this noise limit.
- L. Drainage shall be disposed of in an approved area as specified in Section 01 35 43. Existing or new sanitary sewers shall not be used to dispose of drainage.
- M. Take all necessary precautions to preclude the accidental discharge of fuel, oil, etc., in order to prevent adverse effects on groundwater quality.

### 3.04 WELL POINT SYSTEMS

- A. Where necessary, install a vacuum wellpoint system around the excavation to dewater the excavation. Each wellpoint and riser pipe shall be surrounded by a sand filter. Sand shall be of such a gradation that, after initial development of the wellpoints, the quantity and size of soil particles discharged shall be negligible. Wellpoint systems shall be capable of operating continuously under the highest possible vacuum.
- B. Installation of well point systems shall be in accordance with the approved submittal in the presence of the Engineer.

### 3.05 DEEP WELLS

- A. Where necessary, install a deep well system around the excavation to dewater the excavation. Each well shall be surrounded by a sand or gravel filter with adequate gradation such that after development, the quantity and size of soil particles discharged are negligible. Sufficient number of wells shall be installed to lower the groundwater level to allow excavation to proceed in-the-dry.
- B. Installation of deep wells shall be in accordance with the approved submittal in the presence of the Engineer.

### 3.06 OBSERVATION WELLS

- A. Install observation wells as required in accordance with Section 31 09 00 to monitor groundwater levels beneath and around the excavated area until adjacent structures are completed and backfilled.
- B. Observation wells should be located, installed, protected, maintained and monitored in accordance with Section 31 09 00.

### 3.07 REMOVAL OF SYSTEMS

- A. At the completion of the excavation and backfilling work, and when approved by the Engineer, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the Contractor. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.
- B. Leave in place any casings for deep wells, wellpoints or observation wells located within the plan limits of structures or pipelines or within the zone below a 1H:1V plane extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.
- C. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 3-ft below finished ground level or 1-ft below foundation level so as not to interfere with finished structures or pipelines.
- D. When directed by the Engineer, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

END OF SECTION

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## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.
- B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures and appurtenances.
- C. Furnish and place all sheeting, bracing and supports and shall remove from the excavation all materials which the Engineer may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.
- D. All excavation, trenching and related sheeting, bracing, etc., shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926 Subpart P) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.
- E. Wherever the requirement for 95 percent compaction is referred to herein it shall mean "at least 95 percent of maximum density as determined by ASTM D698".
- F. Prior to the start of work submit the proposed method of backfilling and compaction to the Engineer for review.

### 1.02 RELATED WORK

- A. Earthwork is included in Section 31 23 00.
- B. Dewatering and Drainage is included in Section 31 23 19.
- C. Excavation Support and Protection is included in Section 31 75 01.

### 1.03 SUBMITTALS

- A. Refer to Section 31 23 00 Paragraph 1.03 for required submittals.

### 1.04 REFERENCED STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M 288 - Geotextiles.

- B. ASTM International:
  - 1. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- C. Occupational Safety and Health Administration (OSHA):
  - 1. 29 CFR Part 1926 Subpart P.
- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 QUALITY ASSURANCE

- A. At all structures, prior to the placement of bedding material or backfill, coordinate with Contractor's Quality Control Laboratory (QCL) to verify the suitability of the existing subgrade soil.
- B. Prior to and during the placement of backfill and fill coordinate with Contractor's QCL to perform in-place soil density tests to verify that the backfill/fill material has been placed and compacted in accordance with the compaction requirements specified elsewhere. At least 48 hours notice shall be provided prior to placement of backfill and fill.
- C. Subgrades shall not be covered with fill nor fill placed without the observation, testing, and approval by Contractor's QCL. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer at no expense to the Owner.
- D. Materials will be tested and observed as described in the following paragraphs. Cooperate by allowing free access to the work for selection of test materials and observations.
  - 1. Materials to be used in the work shall be tested by a certified independent laboratory, engaged by the Contractor and acceptable to the Engineer, to demonstrate conformance with the requirements of these Specifications. Such testing will be paid for by the Contractor. Deliver test reports and material certifications to the Engineer before using any material in the work.
  - 2. If field test results are not in conformance with the requirements of these Specifications, all costs involved in correcting deficiencies in compacted materials to the satisfaction of the Engineer and costs of re-testing after correction of deficiencies shall be borne by the Contractor.
  - 3. Earthwork activities performed without properly scheduled inspection are subject to removal and replacement or additional testing as directed by the Engineer at no expense to the Owner.
  - 4. Testing methods shall comply with the latest applicable ASTM or equivalent AASHTO Standards specified.

5. During the placement of bedding, backfill and fill, the Contractor shall perform in-place soil density testing to confirm that fill material has been compacted in accordance with the requirements of this Section. The Engineer may designate areas to be tested. Contractor shall notify Engineer at least 72 hours in advance of scheduled compaction testing. In place soil density tests on backfill/fill material shall be as required by City, State, or Federal Codes, the project geotechnical report, but in no instance, shall be less than those listed below:
    - a. Trench Excavations. At least one nuclear density and moisture content test shall be conducted at a maximum of 50-ft intervals for each lift of fill placed or as directed by the Engineer.
    - b. The Engineer may designate additional areas to be tested.
  6. Materials which have been previously tested may be subjected to further testing from time to time and may be rejected if it is determined that they do not conform to the requirements of these Specifications. Rejected materials shall be removed from the work immediately when so directed by the Engineer, notwithstanding the results of previous testing.
- E. The Engineer or Owner may conduct additional soil testing. Cooperate fully in obtaining the information desired and allowing free access to the work.

## PART 2 PRODUCTS

### 2.01 GEOTEXTILES

- A. Refer to Section 31 23 00 Earthwork for granular materials and geotextile specifications.

## PART 3 EXECUTION

### 3.01 TRENCH EXCAVATION

- A. Excavations for the installation of pipes shall be made to the depths indicated on the Drawings. The minimum trench width shall extend 24 inches beyond the outside diameter of the pipe as indicated on the Drawings and shall be sufficient for installing structures, pipes, or ducts, for bracing and supporting and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and, in all respects, acceptable to the Engineer.
- B. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.
- C. Strip and stockpile topsoil from grassed areas crossed by trenches. At the Contractor's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.
- D. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.

- E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required by the Engineer at the Contractor's expense.
- F. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last 1-ft of depth.
- G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
- H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

### 3.02 DISPOSAL OF MATERIALS

- A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.
- B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the Engineer. When removal of surplus materials has been approved by the Engineer, dispose of such surplus material in approved designated areas.
- C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

### 3.03 SUPPORT OF EXCAVATION

- A. Refer to Section 31 75 01 Excavation Support and Protection.

### 3.04 TEST PITS

- A. Excavation of test pits may be required for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.
- B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.

### 3.05 EXCAVATION BELOW GRADE AND REFILL

- A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.
- B. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.
- C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of crushed stone or screened gravel wrapped in filter fabric. Number 57 stone shall then be placed under the pipe and up to the spring line of the pipe as shown on standard trench bedding detail.

### 3.06 BACKFILLING

- A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously. Bedding gravel, as specified for the type of pipe installed, shall be placed up to 1-ft over the pipe.
- B. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every 300-ft, whichever is less.
- C. Where the pipes are laid in paved areas, the remainder of the trench up to a depth of 12-in below the bottom of the specified permanent paving shall be backfilled with common fill material in layers not to exceed 1-ft and thoroughly compacted.
- D. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level 1-ft over the pipe.
- E. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 95 percent compaction in non-paved areas and 98 percent compaction in paved areas. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.
- F. Compaction by puddling or water jetting shall not be permitted.
- G. Compaction in confined areas shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material shall be spread and compacted in layers not

exceeding 6-in thick, uncompacted loose measure thickness. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.

- H. Backfill around structures shall be select common fill material as specified and as shown on the Drawings. All backfill shall be spread and compacted as specified, especially under and over pipes connected to the structures.
- I. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.
- J. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

### 3.07 RESTORING TRENCH SURFACE

- A. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.
- B. In, and adjacent to streets, the 12-in of trench backfill below the specified initial pavement shall consist of compacted crushed stone. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor, at his/her own expense, have samples of the material tested by an independent testing laboratory at intervals not to exceed 500-ft, in order to establish its compliance with the specifications. Only material which has been tested and approved by the Engineer shall be allowed to be incorporated into the work.
- C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored to a condition at least equal to that existing before work began.
- D. In sections where the pipeline passes through grassed areas, and at the Contractor's own expense, remove and replace the sod, or loam and seed the surface to the satisfaction of the Engineer.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. The work specified in this Section includes requirements for excavation and support of temporary excavations, launch and exit shafts and trenches. The Contractor shall design, furnish, install, and maintain a system of supports, including all bracing and associated items, to retain excavations in a safe manner and to control ground movements. Upon completion of the required construction, the system of supports shall be completely removed, and the excavation and staging area sites restored as discussed herein.
- B. The work shall include site grading; fencing and signing; construction staging areas; design and construction of excavation support systems; design and construction of thrust blocks; disposal of excavated material, surface water, and groundwater; backfilling; and site restoration. Work shall include all labor, materials, and equipment required to complete excavation support.
- C. Retain the services of a professional engineer registered in the State of Tennessee to prepare excavation support and protection system designs and submittals described herein.
- D. Work shall include the design, equipment, materials, installation, protection, and monitoring of geotechnical instrumentation, as defined in Section 31 09 00, required to monitor the performance of the excavation support system as required herein.
- E. The Contractor shall be responsible for choosing and sizing the support of excavation systems. The size of the systems shall, however, be adequate for removal of material as indicated on the Drawings and to provide adequate space to meet the Contractor's work requirements for his/her selected methods of construction. The excavation support system shall be chosen such that it limits the amount of ground movements and protects the adjacent structures.
- F. Vertical support members installed below mid-diameter of any pipe or within the zone of influence of new or existing structures shall be left in place. The zone of influence is defined as 2 feet beyond of edge of foundations, then outward and downward at a slope of 1 horizontal to 1 vertical.
- G. All excavations and support systems shall conform to applicable OSHA excavation, trenching, and shoring standards which are contained in the U.S. Code of Federal Regulations 29 (C.F.R.) 1926.650-1926.653, other federal, state or local requirements. In the event of a conflict, comply with the more restrictive applicable requirements.

### 1.02 RELATED WORK

- A. Shop Drawings, Product Data, and Samples are included in Section 01 33 23.
- B. Geotechnical Instrumentation is included in Section 31 09 00.

- C. Earthwork is included in Section 31 23 00.
- D. Dewatering and Drainage are included in Section 31 23 19.
- E. Trenching, Backfilling and Compaction is included in Section 31 23 33.

### 1.03 SUBMITTALS

- A. Submit to the Engineer in accordance with Section 01 33 23, Shop Drawings and design calculations for the Contractor-designed excavation support system stamped by a Professional Engineer in the State of Tennessee. Submittals shall indicate the following, as a minimum:
  - B. Shop Drawings shall include:
    - 1. Provide overall plan layout of the system, indicating clearances, dimensions, material properties, member sizes, locations, spacing and penetration depths of all members, locations of various types of lateral supports. Indicate existing and proposed utilities, structures or other obstruction, location and type of instrumentation and monitoring points within the area of influence of the excavation and thrust block dimensions for entry pit excavation support as required.
    - 2. Provide wall elevations and locations of all bracing.
    - 3. Show the overall sequence of installation and removal of bracing, indicating levels to which the work will be carried out before bracing is installed or removed.
    - 4. Method of preloading bracing (if required) and the preload for each member, and the method of locking-off the preload. Include detailed drawings of the connections, jacking supports and method of shimming, and data for gage and jack calibration certified by an accepted testing agency.
    - 5. Details, layout, arrangement, equipment requirements, and method of construction of the proposed excavation support system.
    - 6. Design lateral pressures used for each system.
    - 7. Procedures for resolving difficulties arising from misalignment of members exposed during excavation, and criteria for implementing those procedures.
  - C. Design calculations shall include:
    - 1. Loads on the excavation support system for all stages of excavation, jacking operation, bracing removal, and concrete placement, including material and equipment loads on adjacent ground during construction.
    - 2. Design of wall and all bracing members including all details for all stages of construction. Design shall account for water pressures associated with flood conditions.



3. Theoretical deflections of excavation support system and deformation of structures, pipelines, and other improvements located within the area of influence of the excavation.
  4. Submit to the Engineer for review and acceptance, a plan of action to be implemented in the event any threshold value for deformation, as specified in 31 09 00, is reached. The plan of actions shall be positive measures by the Contractor to limit further movement of the wall including but not limited to trenching for struts and wales, placement of granular earth berms against the wall, installation of additional struts, or combinations thereof. The details of the mitigating measures shall include a schedule of implementation, location and/or availability of materials, structural details for all connections to the wall and support elements, and a detailed description of the method of implementation. The Contractor shall be prepared to work 24 hours per day to implement such measures. The remedial work/mitigating measures shall be at no additional cost to the Owner.
- D. Submit quality control measures as required to ensure that the performance of the excavation support system is consistent with the approved shop drawings and the requirements herein.
  - E. Submit welder qualifications and weld procedures in accordance with AWS D1.1.
  - F. Submit Contractor's and Design Engineer's qualifications as described in herein
  - G. At least one copy of the design shall be maintained at the job site during excavation that includes a plan indicating the sizes, types, and configurations of the materials to be used in the protective system, and the identity of the registered engineer who approved the design.
  - H. Do not proceed with any support of excavation or protection activities until the submittal has been reviewed by the Engineer.
  - I. Contractor's Design Engineer's documentation shall include:
    1. On-site inspections of excavation support system as the systems are constructed.
    2. Review of quality control measures and performance data.
    3. Certification that the excavation support system is constructed per the applicable design following completion of each support system and following any modifications by Contractor during construction.

## 1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM)
  1. ASTM A36 - Specification for Structural Steel Standard Specifications
  2. ASTM A242 - Standard Specification for High-Strength Low-Alloy Structural Steel
  3. ASTM A252 - Standard Specification for Welded and Seamless Steel Pipe Piles

4. ASTM A328 - Standard Specification for Steel Sheet Piling
  5. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium Vanadium Structural Steel
  6. ASTM A690 - Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments
  7. ASTM C33 - Standard Specification for Concrete Aggregates
  8. ASTM C150 - Standard Specification for Portland Cement
- B. American Welding Society (AWS)
1. AWS D1.1 for Public Works Construction
- C. Codes
1. U.S. Occupational Safety and Health Administration (OSHA) Regulations, 29 CFR Part 1926 Subpart P - Excavations.
- D. Norfolk Southern Corporation (NSC)
1. Specifications for Pipeline Occupancy of Norfolk Southern Corporation Property
- E. Where reference is made to one of the above standards the revision in effect at the time of the bid opening shall apply.

## 1.05 QUALITY ASSURANCE

- A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.
- B. The Contractor shall have at least 5 years of experience with work compatible to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of Work.
- C. The Contractor's Design Engineer shall be a Professional Engineer registered in the State of Tennessee with at least 5 years professional experience in the design and construction of support of excavation systems and shall have completed not less than 5 successful excavation support projects of equal type, size, and complexity to that require for the work.

## 1.06 DESIGN REQUIREMENTS

- A. The design of temporary excavation support systems is the responsibility of the Contractor. The design calculations and drawings shall be prepared, stamped and signed by a Professional Engineer registered in the State of Tennessee, who is experienced in designing similar excavation support systems.

- B. Design temporary excavation support systems in accordance with requirements of this Section and minimum lateral earth pressures shown on the Drawings. These criteria are the minimum acceptable standards. Cooper E-80 loading shall be taken into account for all excavations within the zone of influence of the railroad as defined in the NSC specifications.
- C. All underground utility lines shall be identified, located, and protected from damage or displacement. Utility companies and other responsible authorities shall be contacted to locate and mark the locations and, if they so desire, direct or assist with protecting the underground installation. When required, the Contractor shall obtain an excavation permit from the local authority having jurisdiction prior to the initiation of any excavation work.
- D. Design excavation support systems in accordance with all OSHA requirements and other local and agency requirements.
- E. Design the support system to minimize horizontal and vertical movements and to protect adjacent structures, railways and utilities from damage.
- F. Excavations below the level of the base of any adjacent foundation or retaining wall shall not be permitted unless the design of the excavation and bracing includes an analysis of the stability of the structure supported by the foundation and as necessary, incorporates required bracing/underpinning of the foundation.
- G. For support systems in which bracing is installed between opposite sides of the excavation, design the excavation support of both sides to be nearly the same as feasible.
- H. Where necessary to resist point loads, pipe piles used as soldier piles shall be filled with concrete with a compressive strength not less than 3,000 psi. The strength of the concrete shall not be considered in design of the pipe pile for bending stress.
- I. Design, install, operate, and maintain ground water control system to control ground water inflows, prevent piping or loss of ground, and maintain stability of the excavation. Refer to the requirements of Section 31 23 19.
- J. Design, install, operate, and maintain excavation support monitoring points to monitor the performance of the excavation support system in accordance with Section 31 09 00.
- K. Provide temporary fencing around all excavations. Provide pedestrian and traffic control around working areas and support systems located within or adjacent to streets, roadways, freeways, driveways, walkways, or parking lots.
- L. Receipt of the Contractor's plans and methods of construction by the Engineer does not relieve the Contractor of his responsibility to provide an adequate support system achieving the specified requirements. Design review and field monitoring activities by the Owner or by the Engineer shall not relieve the Contractor of his/her responsibilities for the work.
- M. Design review and field monitoring activities by the Owner or by the Engineer shall not relieve the Contractor of his/her responsibilities for the work.

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## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. All timber, structural steel, and steel sheet piling used for the supporting systems, whether new or used, shall be sound and free from defects that may impair their strength.
- B. Soldier piles and structural steel members shall conform to ASTM A572 or ASTM A242 unless approved otherwise. All steel conforming to ASTM A 572 shall be Grade 50 or better. No members with permanent deformations are to be provided. Members shall not be spliced unless approved by the Engineer.
- C. Pipe piles used as soldier piles shall conform to ASTM A252, Grade 3 (45 ksi), or better unless approved otherwise.
- D. Steel sheet piling shall conform to ASTM A328 or ASTM A572 or ASTM A690, unless approved otherwise. All steel sheet piling conforming to ASTM A 572 shall be Grade 50 or better.
- E. Concrete shall conform to ASTM C33 and ASTM C150 unless otherwise approved.
- F. All timber shall be structural grade with a minimum allowable flexural strength of 1100 psi. Timber lagging shall be at least 3 inches thick, and shall be fir, spruce, pine, or hemlock, Grade 1 or 2, rough or planed surface, square edges or tongue and groove and free of large or loose knots.
- G. Wood shims for braces and wales shall not be permitted. Steel shims shall be used when required.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Commence installation of support system and excavations only after shop drawings have been reviewed and accepted by the Engineer.
- B. All instrumentation required per Section 31 09 00 shall be installed and initialized prior to the start of work.
- C. Methods of construction for excavations shall be such as to ensure the safety of the Work, Contractor's employees, Engineer, and Owner's employees and inspectors, the public and adjacent property and improvements, whether public or private.
- D. Before beginning construction at any location of this project, adequately protect existing structures, utilities, trees, shrubs, and other existing facilities. Design excavation support systems to limit deformations that could damage facilities, including utilities and structures. The repair of or compensation for damage to existing facilities shall be at no additional cost to the Owner.

- E. As a minimum, place fencing, gates, lights, and signs as necessary around the excavations and staging areas to provide for public safety.
- F. Monitor performance of excavation support systems for both horizontal and vertical deflections in accordance with Section 31 09 00. If monitoring data indicates that deflections have exceeded estimated values, increase frequency of monitoring as required by the Engineer. Submit all monitoring measurements to the Engineer on the same day measurements are taken.
- G. Install excavation support systems in accordance with the approved shop drawings and applicable permits.
- H. Care shall be taken to prevent voids outside of the excavation support system, but if voids are formed, they shall be immediately filled with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete or well-graded cohesionless sand as approved by the Engineer at no additional cost to the Owner. Excavations shall be kept free of water at all times and a stable subgrade shall be maintained. Excavations shall be dewatered in accordance with Section 31 23 19.
- I. If unstable material is encountered during excavation, all necessary measures shall be taken immediately to contain it in place and prevent ground displacement.
- J. If settlement or deflections of supports indicate that support system requires modification to prevent excessive movements, redesign and resubmit revised shop drawings and calculations to the Engineer at no additional cost to the Owner.
- K. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports placed at no additional cost to the Owner. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports.
- L. Conduct all work, including excavation, backfilling, shoring, temporary facilities, materials storage, and construction traffic within limits of work established for the project. All work shall be in accordance with the applicable permits and the approved shop drawings.
- M. Sufficient quantity of material shall be maintained on site for protection of work and for use in case of accident or emergency.
- N. All welding shall conform to the applicable provisions of ANSI/AWS D1.1.

### 3.02 PORTABLE TRENCH BOXES

- A. Portable trench boxes or sliding trench shields may be used for the protection of workers only.
- B. Trench boxes shall not be used as entry and exit pits for pipe jacking.
- C. No trench box is allowed for excavations that extend within the zone of influence of existing structures, railroads and sensitive utilities. The zone of influence is defined as

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a line extending from the springline of pipes or at least 2 feet beyond of edge of foundations, then outward and downward at a slope of 1 horizontal to 1 vertical.

- D. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.
- E. When installing rigid pipe (RC, etc.), any portion of the box extending below mid-diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.
- F. When installing flexible pipe (PVC, DI, FRP, etc.) trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompact to provide uniform side support for the pipe.
- G. Additional excavation, backfilling, and surface restoration required as the result of trench box use shall be at no additional cost to the Owner.
- H. Trench boxes or shields shall be designed, constructed, and maintained to meet acceptable engineering and industry standards.
- I. Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.
- J. A copy of the trench box manufacturer's specifications, recommendations, and limitations shall be in written form and maintained at the job site during all excavation work.

### 3.03 SOLDIER PILES AND LAGGING

- A. Install soldier piles with the minimum embedment depths as shown on approved shop drawings.
- B. Soldier piles shall be installed using an impact hammer, a vibratory hammer, or in predrilled holes.
- C. Driven piles shall be installed with driving shoes where hard driving is anticipated.
- D. For soldier piles installed in predrilled holes, provide casing or other methods of support as necessary to prevent caving of holes and loss of ground.
- E. Predrilled holes for soldier piles shall be backfilled with concrete from the pile tip elevation to the elevation of the bottom of the excavation. The remainder of the predrilled hole shall be backfilled with lean concrete or sand. Concrete strength shall be in accordance with the approved shop drawings.
- F. The predrilled hole diameter shall be sufficient to allow for proper alignment and concrete backfilling of the pile.

- G. Driven soldier piles shall be advanced without the aid of a water jet.
- H. Provide timber lagging of sufficient thickness to withstand earth pressures and in accordance with the approved shop drawings.
- I. Install lagging such that ground loss does not occur between adjacent or below the lowest board. As excavation proceeds, the maximum height of unlagged face of excavation shall not exceed 4 feet. The unlagged face shall not exceed 2-ft if water seeps or flows from the face of the excavation or if the face of the excavation becomes unstable.
- J. As installation progresses, backfill the voids between the excavation face and the lagging. Pack with materials such as hay, burlap, or geotextile filter fabric where necessary to allow drainage of groundwater without loss of ground.

### 3.04 STEEL SHEET PILING

- A. Install steel sheet piling with the minimum embedment depths as shown on the approved shop drawings.
- B. Drive sheeting in plumb position with each sheet pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground. Exercise care in driving so that interlocking members can be extracted without damaging adjacent structures or utilities. The methods of driving, cutting, and splicing shall conform to the approved shop drawings.
- C. Use templates or other temporary alignment facilities to maintain piling line.
- D. Prior to installation, the sheet piles shall be thoroughly cleaned and inspected for defects and for proper interlock dimensions. The Contractor shall provide a tool for checking the interlock dimensions.
- E. Each sheet pile shall have sufficient clearance in the interlocks to slide, under its own weight, into the interlock of the sheet pile previously placed.
- F. Excavation shall not be carried in advance of steel sheet piling installation.
- G. Where obstructions are anticipated, pre-excavation or pre-drilling along the sheet pile wall alignment shall be conducted at no additional cost to the Owner. Pre-excavation and pre-drilling shall not extend below the lowest excavation level or into bearing soils for existing or future structures.
- H. Obstructions encountered before the specified embedment for piles shall be removed. Where obstructions cannot be removed, the sheet pile system shall be re-evaluated by the Contractor's Design Engineer for the resulted reduced embedment and additional toe stability measure implemented, as required or for realignment of the sheet pile wall. A submittal of the proposed measures shall be provided.
- I. Damaged piling or piling with faulty alignment shall be withdrawn and new piling driven properly in its place. The cost of such additional work shall be considered as part of the pile driving and shall be borne by the Contractor.

### 3.05 INTERNAL BRACING

- A. Provide internal bracing including wales and struts to carry maximum design load without distortion or buckling.
- B. Include web stiffeners, plates, or angles as needed to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.
- C. Install and maintain all bracing support members in tight contact with each other and with the surface being supported. Wood shims shall not be used.
- D. Coordinate excavation work with installation of bracing. Excavation shall extend no more than 2 feet below any brace level prior to installation of the bracing.
- E. Use procedures that produce uniform loading of bracing member without eccentricities or overstressing and distortion of members of system.

### 3.06 REMOVAL OF EXCAVATION SUPPORT

- A. Do not remove internal bracing and transfer loads to the permanent structure without prior acceptance of the Engineer.
- B. Removal shall begin at and progress from the bottom of the excavation. Members shall be released slowly as to note any indication of possible failure of the remaining members or possible cave-in of the sides of the excavation.
- C. Backfilling shall progress together with the removal of support systems from excavations.
- D. Unless otherwise indicated, remove all portions of excavation support.
- E. Do not remove vertical support members that were installed within the zone of influence of new or existing structures. The zone of influence is defined as a zone extending 2 feet beyond of edge of foundations, then outward and downward at a slope of 1 horizontal to 1 vertical. Support members installed within this zone shall be cut off at 5 ft below finished grade and abandoned in place.
- F. No wood shall remain as part of the abandoned portion of the work.
- G. When removing the excavation support system, do not disturb or damage adjacent buildings, structures, waterproofing material, or utilities. Fill voids immediately with lean concrete or well-graded cohesionless sand, as indicated or as directed by the Engineer.
- H. Remove material of the excavation support system from the site immediately.

END OF SECTION



## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals necessary and place loam, finish grade, seed, and maintain all seeded areas as specified herein including all areas disturbed by construction operations.

### 1.02 RELATED WORK

- A. Section 01 57 13: Erosion and Sedimentation Control.
- B. Section 31 10 00: Site Preparation.
- C. Section 31 23 00: Earthwork.
- D. Section 31 23 33: Trenching, Backfilling, and Compaction.
- E. Section 32 90 10: Landscaping.

### 1.03 SUBMITTALS

- A. Submit to the Engineer in accordance with Section 01 33 23 complete product data for all materials furnished under this Section, including seed mixtures and product label information.
- B. Submit to the Engineer in accordance with Section 01 33 23 samples of all materials for inspection and acceptance if requested.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Loam shall be fertile, natural soil, typical of the locality; free from large stones, roots, sticks, peat, weeds and sod; obtained from naturally well drained areas; not excessively acid nor alkaline, nor contain toxic material harmful to plant growth. Topsoil stockpiled as specified may be used, but additional loam shall be furnished at no additional expense, if required.
- B. Fertilizer shall be complete commercial fertilizer, 10-10-10 grade. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing.
- C. Lime shall be ground limestone containing not less than 85 percent calcium and magnesium carbonates.

- D. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85, and shall have not more than one percent weed content.
- E. Seed shall be furnished and delivered premixed in the proportions specified in Paragraph 3.02 F. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturer for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the required certificates have been submitted.
- F. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.
- G. Contractor shall be responsible for providing and paying for water used as part of this section.

## PART 3 EXECUTION

### 3.01 APPLICATION

- A. Loam shall be placed to a minimum depth of 4 inches.
- B. Lime shall be applied at the rate of 1-1/2 tons per acre.
- C. Fertilizer shall be applied at the rate of 800 pounds per acre.
- D. The application of fertilizer and lime may be performed hydraulically in one operation with hydroseeding and mulching. If lime is applied in this manner, clean all structures and paved areas of unwanted deposits.

### 3.02 INSTALLATION

- A. No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry.
- B. The subgrade of all areas to be loamed and seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed. Loam shall be spread and lightly compacted to finished grade. Compacted loam shall not be less than the depth specified. No loam shall be spread in water or while frozen or muddy.
- C. After the loam is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over the loam surface and thoroughly incorporated with loam by heavy raking to at least one half the depth of loam.
- D. Fertilizer shall be uniformly spread and disked or roto-tilled to a depth of at least 4 inches.

- E. Immediately following this preparation the seed shall be uniformly applied and lightly raked into the surface. Lightly roll the surface and water with fine spray. Seed shall be applied, depending on the period of year, at the following rates:

<u>Seeding Date</u>	<u>Seed</u>	<u>Rates</u>
Apr 15 – Aug 15	Kentucky Tall Fescue #31	100 lbs/acre
	Bermuda (unhulled)	40 lbs/acre
	Bahia	40 lbs/acre
	Centipede	15 lbs/acre
	German Millet	35 lbs/acre
Aug 15 - Apr 15	Kentucky Tall Fescue #31	100 lbs/acre
	Bermuda (hulled)	40 lbs/acre
	Bahia	40 lbs/acre
	Centipede	15 lbs/acre
	German Millet	25 lbs/acre
	Winter Rye (grain)	30 lbs/acre

- F. Temporary seed mixtures shall be in accordance with Section 31 25 00 – Sedimentation and Erosion Control and the Contract Drawings.
- G. Seeding shall be done within 10 days following soil preparation. Seed shall be applied hydraulically at the rates and percentages indicated. The spraying equipment and mixture shall be so designed that when the mixture is sprayed over an area, the grass seed and mulch shall be equal in quantity to the specified rates.

### 3.03 MAINTENANCE AND PROVISIONAL ACCEPTANCE

- A. Keep all seeded areas watered and in good condition, reseeding if and when necessary until a good, healthy, uniform growth is established over the entire area seeded. Maintain seeded areas in an approved condition including a minimum of two mowings of the lawn areas until provisional acceptance. Mowing shall be scheduled so as to maintain a minimum stand height of 4 inches. Stand height shall be allowed to reach 7-9 inches prior to mowing.
- B. On slopes, protect against washouts by approved methods. Any washout which occurs shall be regraded and reseeded at no additional expense to Owner until a good sod is established.
- C. The Engineer will inspect all work for provisional acceptance at the end of the eight-week grass maintenance period, upon the written request, received at least ten days before the anticipated date of inspection.
- D. A satisfactory stand will be defined as follows:
1. No bare spots larger than 3 square feet.
  2. No more than 10 percent of total area with bare spots larger than 1 square foot.

3. Not more than 15 percent of total area with bare spots larger than 6-in square.
  - E. Furnish full and complete written instructions for maintenance of the lawns to the Owner at the time of provisional acceptance.
  - F. The inspection by the Engineer will determine whether maintenance shall continue in any area of manner.
  - G. After all necessary corrective work and clean-up has been completed, and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the lawn areas. Maintenance of lawns, or parts of lawns, shall cease on receipt of provisional acceptance.

### 3.04 GUARANTEE PERIOD AND FINAL ACCEPTANCE

- A. All seeded areas shall be guaranteed for not less than one full year from the time of final completion.
- B. At the end of the guarantee period, inspection will be made by the Owner upon written request submitted at least ten days before the anticipated date. Lawn areas not demonstrating satisfactory stands as outlined above, as determined by the Owner, shall be renovated, reseeded and maintained meeting all requirements as specified herein.
- C. After all necessary corrective work has been completed, the Owner shall certify in writing the final acceptance of the lawns.

END OF SECTION

## PART 1 GENERAL

### 1.01 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to install and test all buried piping, fittings, and specials. The Work includes the following:
  - a. All types and sizes of buried piping, except where buried piping installations are specified under other Sections.
  - b. Unless otherwise shown or specified, this Section includes all buried piping Work required, beginning at the outside face of structures or structure foundations, including piping beneath structures, and extending away from structures.
  - c. Work on or affecting existing buried piping.
  - d. Installation of all jointing and gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, cathodic protection, and other Work required for a complete, buried piping installation.
  - e. Supports, restraints, and thrust blocks.
  - f. Pipe encasements.
  - g. Field quality control, including testing.
  - h. Cleaning and disinfecting.
  - i. Incorporation of valves, and special items shown or specified into piping systems in accordance with the Contract Documents and as required.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before buried piping Work.
2. Coordinate with appropriate piping Sections of Division 33.

C. Related Sections:

1. Section 31 23 33 - Trenching, Backfilling and Compaction.
2. Section 31 11 00 - Clearing and Grubbing.
3. Section 31 23 00 - Earthwork
4. Section 31 23 16 - Rock Removal
5. Section 33 05 19 – Ductile Iron Pipe
6. Section 33 05 31 – Thermoplastic Pipe
7. Section 33 05 39 – Concrete Pipe

## 1.02 REFERENCES

### A. Standards referenced in this Section are:

1. ASTM C12, Practice for Installing Vitrified Clay Pipe Lines.
2. ASTM C425, Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
3. ASTM C828, Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines.
4. ASTM C924, Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Test Method.
5. ASTM D2321, Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
6. ASTM D2774, Practice for Underground Installation of Thermoplastic Pressure Piping.
7. ASTM F1417, Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air.
8. ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
9. ANSI/AWWA C105, Polyethylene Encasement for Ductile-Iron Pipe Systems.
10. ANSI/AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
11. ANSI/AWWA C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
12. ANSI/AWWA C603, Installation of Asbestos-Cement Pressure Pipe.
13. ANSI/AWWA C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
14. ANSI/AWWA C651, Disinfecting Water Mains.
15. AWWA M9, Concrete Pressure Pipe.
16. AWWA M23, PVC Pipe - Design and Installation.
17. AWWA M41, Ductile-Iron Pipe and Fittings.
18. AWWA M55, PE Pipe - Design and Installation.
19. ASCE 37, Design and Construction of Sanitary and Storm Sewers.

20. American Concrete Pipe Association, Concrete Pipe Handbook.
21. NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

### 1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
  1. Comply with requirements and recommendations of authorities having jurisdiction over the Work.
  2. Obtain required permits for Work in roads, rights of way, railroads, and other areas of the Work.
- B. The bell ends of pipe shall face the direction of laying unless otherwise directed by the ENGINEER, for lines on appreciable slope, the ENGINEER may require that bell ends face upgrade.

### 1.04 SUBMITTALS

- A. Action Submittals: Submit the following:
  1. Shop Drawings:
    - a. Laying schedules for all piping.
    - b. Details of piping, specials, joints, harnessing and thrust blocks, and connections to piping, structures, equipment, and appurtenances.
  2. Product Data:
    - a. Manufacturer's literature and specifications, as applicable, for products specified in this Section.
  3. Testing Procedures:
    - a. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER's approval prior to commencing testing.
- B. Informational Submittals: Submit the following:
  1. Certificates:
    - a. Certificate signed by manufacturer of each product certifying that product conforms to applicable referenced standards.
  2. Field Quality Control Submittals:
    - a. Results of each specified field quality control test.
- C. Closeout Submittals: Submit the following:
  1. Record Documentation:
    - a. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work. Submittal shall show

actual location of all piping Work and appurtenances at same scale as the Drawings.

- b. Show piping with elevations referenced to Project datum and dimensions from permanent structures. For each horizontal bend in piping, include dimensions to at least three permanent structures, when possible. For straight runs of piping provide offset dimensions as required to document piping location.
- c. Include profile drawings with buried piping record documents when the Contract Documents include piping profile drawings.
- d. Conform to Section 01 78 39, Project Record Documents.

## 1.05 DELIVERY, STORAGE AND HANDLING

### A. Delivery:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Upon delivery inspect pipe and appurtenances for cracking, gouging, chipping, denting, and other damage and immediately remove from Site and replace with acceptable material.

### B. Storage:

1. Store materials to allow convenient access for inspection and identification. Store material off ground using pallets, platforms, or other supports. Protect packaged materials from corrosion and deterioration.
2. Pipe and fittings other than PVC and CPVC may be stored outdoors without cover. Cover PVC and CPVC pipe and fittings stored outdoors.

### C. Handling:

1. Handle pipe, fittings, specials, and accessories carefully in accordance with pipe manufacturer's recommendations. Do not drop or roll material off trucks. Do not drop, roll or skid piping.
2. Avoid unnecessary handling of pipe.
3. Keep pipe interiors free from dirt and foreign matter.
4. Protect interior linings and exterior coatings of pipe and fittings from damage. Replace pipe and fittings with damaged lining regardless of cause of damage.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Piping materials are specified in the Buried Piping Schedule at end of this Section. Piping materials shall conform to Specifications for each type of pipe and piping appurtenances in applicable Sections of Division 33.



B. General:

1. Pipe Markings:

- a. Factory-mark each length of pipe and each fitting with designation conforming to those on approved laying schedules.
- b. Manufacturer shall cast or paint on each length of pipe and each fitting pipe material, diameter, and pressure or thickness class.

C. Exterior Coating

1. Buried piping shall be coated with an asphaltic coating approximately one mil thick, in accordance with AWWA C151, C115, C110, and C153.

D. Polyethylene Encasement:

1. Polyethylene may be supplied in tubes or sheets.
2. Polyethylene encasement materials shall be in accordance with ANSI/AWWA C105.
3. Polyethylene wrap may be Linear Low Density wrap 8 mils thick or Cross-laminated High Density wrap 4 mils thick.

## 2.02 BURIED PIPING IDENTIFICATION

A. Polyethylene Underground Warning Tape for Metallic Pipelines:

1. Tracer tape shall be of inert, acid- and alkali-resistant, polyethylene, four mils thick, six inches wide and a minimum of 5 mil thickness manufactured in accordance with ASTM-D-1000, suitable for direct burial. Tape shall be capable of stretching to twice its original length.
2. Message shall read, "CAUTION [insert customized name of pipe service, i.e., "POTABLE WATER", "SANITARY SEWER" or other service as appropriate, as indicated in the Buried Pipe Schedule at the end of this Section] PIPE BURIED BELOW", with bold letters approximately two and a half inches high. Messages shall be printed at maximum intervals of one foot. Tape shall be purple for sanitary sewer force main. For other applications, the tape shall be custom colored in accordance with Great Lakes Upper Mississippi Rivers Board State Public Health Environmental Managers Recommended Standards for Water Works.
3. Manufacturer: Provide products of one of the following:
  - a. Brady Corporation
  - b. Seton Identification Products
  - c. Marking Services, Inc.
  - d. Or equal.

B. Detectable Underground Warning Tape for Non-Metallic Pipelines:

1. Tape shall be of inert, acid- and alkali-resistant, polyethylene, five mils thick, six inches wide, with aluminum backing, and have 15,000 psi tensile strength and 80 percent elongation capability. Tape shall be suitable for direct burial.
2. Message shall read, "CAUTION [insert customized name of pipe service, i.e., "POTABLE WATER", "SANITARY SEWER" , or other appropriate service, as indicated in the Buried Pipe Schedule at the end of this Section] PIPE BURIED BELOW" with bold letters approximately two and a half inches high. Messages shall be printed at maximum intervals of one foot. Tape shall be custom color in accordance with Great Lakes Upper Mississippi Rivers Board State Public Health Environmental Managers Recommended Standards for Water Works.
3. Manufacturer: Provide products of one of the following:
  - a. Brady Corporation
  - b. Seton Identification Products
  - c. Marking Services, Inc.
  - d. Or equal.

C. Utility Pipe Markers and Locator:

1. Provide buried pipe markers at least once every 100 feet of pipe.
2. Markers are to be 4.5-inch diameter HDPE balls with interior copper coils secured by interior foam and capable of a 5-foot detection range at a maximum 6-inch offset.
3. Manufacturers:
  - a. Omnimarker by Tempo.
  - b. Approved Equal.
4. Provide 48 extra water (blue) markers.
5. Provide 2 electronic marker locator wands with soft carrying cases and headphone sets for each by the same manufacturer intended for locating the specified markers.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. General:

1. Install piping as shown, specified, and as recommended by pipe and fittings manufacturer.
2. In event of conflict between manufacturer's recommendations and the Contract Documents, request interpretation from ENGINEER before proceeding.

3. ENGINEER will observe excavations and bedding prior to laying pipe by CONTRACTOR. Notify ENGINEER in advance of excavating, bedding, pipe laying, and backfilling operations.
4. Minimum cover over buried piping shall be three feet, unless otherwise shown or approved by ENGINEER.
5. Section 31 23 33 covers Trenching and Backfilling.
6. Excavation in excess of that required or shown, and that is not authorized by ENGINEER shall be filled at CONTRACTOR's expense with granular material furnished, placed, and compacted in accordance with applicable Sections.

B. Plugs:

1. Temporarily plug installed pipe at end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe.
2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.
3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.
4. Where plugging is required for phasing of the Work or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to ENGINEER.

C. Bedding Pipe: Bed pipe as specified and in accordance with details shown on the Contract Drawings.

1. Trench excavation and backfill, and bedding materials shall conform to Section 31 23 33 Trenching and Backfilling, as applicable.
2. Where ENGINEER deems existing bedding material unsuitable, remove and replace existing bedding with approved granular material furnished, placed, and compacted in accordance with the defined trench conditions
3. Where ENGINEER deems the existing soil is suitable for bedding purposes, it shall be used.
4. Carefully and thoroughly compact pipe bedding with hand held pneumatic compactors.
5. Do not lay pipe until ENGINEER approves bedding condition.
6. Do not bring pipe into position until preceding length of pipe has been bedded and secured in its final position.

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D. Laying Pipe:

1. Conform to manufacturer's instructions and requirements of standards and manuals listed below, as applicable:
  - a. Ductile Iron Pipe: ANSI/AWWA C600, ANSI/AWWA C105, AWWA M41.
  - b. Concrete Pipe: AWWA M9.
  - c. Thermoplastic Pipe: ASTM D2321, ASTM D2774, ANSI/AWWA C605, AWWA M23, AWWA M45, AWWA, M55.
2. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by ENGINEER. Remove and reinstall pipes that are not installed correctly.
3. Slope piping uniformly between elevations shown.
4. Keep groundwater level in trench at least 24 inches below bottom of pipe before laying pipe. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.
5. Start laying pipe at lowest point and proceed towards higher elevations, unless otherwise approved by ENGINEER.
6. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by ENGINEER.
7. Place concrete pipe containing elliptical reinforcement with minor axis of reinforcement in vertical position.
8. Excavate around joints in bedding and lay pipe so that pipe barrel bears uniformly on trench bottom.
9. Deflections at joints shall not exceed 75 percent of amount allowed by pipe manufacturer, unless otherwise approved by ENGINEER.
10. For PVC and CPVC piping with solvent welded joints, 2.5-inch diameter and smaller, and copper tubing, snake piping in trench to compensate for thermal expansion and contraction.
11. Carefully examine pipe, fittings, valves, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the Site and replace with acceptable products.
12. Inspect interior of all pipe, fittings, valves, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be thoroughly wire brushed, and wiped clean and dry immediately before pipe is laid.
13. Field cut pipe, where required, with machine specially designed for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating

or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.

14. Do not place blocking under pipe, unless specifically approved by ENGINEER for special conditions.
  15. Touch up protective coatings in manner satisfactory to ENGINEER prior to backfilling.
  16. Notify ENGINEER in advance of backfilling operations.
  17. On steep slopes, take measures acceptable to ENGINEER to prevent movement of pipe during installation.
  18. Thrust Restraint: Where required, provide thrust restraint conforming to Article 3.3 of this Section.
  19. Exercise care to avoid flotation when installing pipe in cast in-place concrete, and in locations with high groundwater.
- E. Polyethylene Encasement:
1. Provide polyethylene encasement, where indicated, for ductile iron piping to prevent contact between pipe and surrounding bedding material and backfill.
  2. Polyethylene encasement installation shall be in accordance with ANSI/AWWA C105.
- F. Jointing Pipe:
1. Ductile Iron Mechanical Joint Pipe:
    - a. Immediately before making joint, wipe clean the socket, plain end, and adjacent areas. Taper cut ends and file off sharp edges to provide smooth surface.
    - b. Lubricate plain ends and gasket with soapy water or manufacturer's recommended pipe lubricant, in accordance with ANSI/AWWA C111, just prior to slipping gasket onto plain end of the joint assembly.
    - c. Place gland on plain end with lip extension toward the plain end, followed by gasket with narrow edge of gasket toward plain end.
    - d. Insert plain end of pipe into socket and press gasket firmly and evenly into gasket recess. Keep joint straight during assembly.
    - e. Push gland toward socket and center gland around pipe with gland lip against gasket.
    - f. Insert bolts and hand-tighten nuts.
    - g. If deflection is required, make deflection after joint assembly and prior to tightening bolts. Alternately tighten bolts approximately 180 degrees apart to seat gasket evenly. Bolt torque shall be as follows:

Pipe Diameter (inches)	Bolt Diameter (inches)	Range of Torque (ft-lbs)
3	5/8	45 to 60
4 to 24	3/4	75 to 90
30 to 36	1	100 to 120
42 to 48	1.25	120 to 150

- h. Bolts and nuts, except those of stainless steel, shall be coated with two coats, minimum dry film thickness of eight mils each, of high build solids epoxy or bituminous coating manufactured by Themec, or equal.
  - i. Restrained mechanical joints shall be in accordance with Section 33 05 19, Ductile Iron Pipe.
2. Ductile Iron Push-On Joint Pipe:
- a. Prior to assembling joints, thoroughly clean with wire brush the last eight inches of exterior surface of spigot and interior surface of bell, except where joints are lined or coated with a protective lining or coating.
  - b. Wipe clean rubber gaskets and flex gaskets until resilient. Conform to manufacturer's instructions for procedures to ensure gasket resiliency when assembling joints in cold weather.
  - c. Insert gasket into joint recess and smooth out entire circumference of gasket to remove bulges and to prevent interference with proper entry of spigot of entering pipe.
  - d. Immediately prior to joint assembly, apply thin film of pipe manufacturer's recommended lubricant to surface of gasket that will come in contact with entering spigot end of pipe, or apply a thin film of lubricant to outside of spigot of entering pipe.
  - e. For assembly, center spigot in pipe bell and push pipe forward until spigot just makes contact with rubber gasket. After gasket is compressed and before pipe is pushed or pulled in the rest of the way, carefully check gasket for proper position around the full circumference of joint. Final assembly shall be made by forcing spigot end of entering pipe past gasket until spigot makes contact with base of the bell. When more than a reasonable amount of force is required to assemble the joint, remove spigot end of pipe to verify proper positioning of gasket. Do not use gaskets that have been scored or otherwise damaged.
  - f. Maintain an adequate supply of gaskets and joint lubricant at the Site when pipe jointing operations are in progress.
  - g. If deflection is required, make deflection after joint assembly and prior to tightening bolts. Alternately tighten bolts approximately 180 degrees apart to seat gasket evenly. In no event, shall more deflection be allowed than 75% of the manufacturer's recommended maximum.
3. Thermoplastic Pipe Joints:
- a. Solvent Cement Welded Joints:
    - 1) Bevel pipe ends and remove all burrs before making joints. Clean pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40 degrees F. Do not make solvent cement welded joints in wet conditions.
    - 2) Use solvent cement supplied or recommended by pipe manufacturer.

- 3) Apply joint primer and solvent cement and assemble joints in accordance with recommendations and instructions of manufacturer of joint materials and pipe manufacturer.
  - 4) Take appropriate safety precautions when using joint primers and solvent cements. Allow air to circulate freely through pipelines to allow solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.
- b. Bell and Spigot Joints:
- 1) Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joints.
  - 2) Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer's recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.
4. Mechanical Coupling Joints:
- a. Prior to installing and assembling mechanical couplings, thoroughly clean joint ends with wire brush to remove foreign matter.
  - b. For mechanical couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends. After lubrication, install gasket around joint end of previously installed piece and mate joint end of subsequent piece to installed piece. Position gasket and place coupling housing around gasket and over grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand. Tighten bolts uniformly to produce an equal pressure on all parts of housing. When housing clamps meet metal to metal, joint is complete and further tightening is not required.
  - c. For plasticized PVC couplings, loosen the stainless steel clamping bands and remove clamps from coupling. Slide coupling over plain ends of pipes to be joined without using lubricants. Place clamps over each end of coupling at grooved section and tighten with torque wrench to torque recommended by manufacturer.
- G. Backfilling:
1. Conform to applicable requirements of Section 31 23 33, Trenching and Backfilling.
  2. Place backfill as Work progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of backfill.
- H. Connections to Valves and Hydrants:
1. Install valves and hydrants as shown and indicated in the Contract Documents.
  2. Provide suitable adapters when valves or hydrants and piping have different joint types.
  3. Provide thrust restraint at all hydrants and at valves located at pipeline terminations.

- I. Transitions from One Type of Pipe to Another:
  - 1. Provide necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- J. Closures:
  - 1. Provide closure pieces shown or required to complete the Work.

### 3.02 TRACER TAPE INSTALLATION

- A. Polyethylene Underground Warning Tape for Metallic Pipelines:
  - 1. Provide polyethylene tracer tape for buried metallic piping, which includes pipe that is steel, ductile iron, cast iron, concrete, copper, and corrugated metal.
  - 2. Provide tracer tape 12 to 18 inches above the pipe, above and parallel to buried pipe.
  - 3. For pipelines buried eight feet or greater below finished grade, provide second line of magnetic tracer tape 12 to 18 inches below finished grade above crown of buried pipe, aligned along pipe centerline.
  - 4. Tape shall be spread flat with message side up before backfilling.
- B. Detectable Underground Warning Tape for Non-Metallic Pipelines:
  - 1. Provide polyethylene tracer tape with aluminum backing for buried, non-metallic piping, which includes pipe that is PVC, CPVC, polyethylene, HDPE, FRP, ABS, and vitrified clay.
  - 2. Provide magnetic tracer tape 12 to 18 inches below finished grade, above and parallel to buried pipe.
  - 3. For pipelines buried eight feet or greater below finished grade, provide second line of magnetic tracer tape 2.5 feet above crown of buried pipe, aligned along the pipe centerline.
  - 4. Tape shall be spread flat with message side up before backfilling.

### 3.03 UTILITY PIPE MARKERS AND LOCATOR

- A. Markers are to be installed directly over the pipe 2 feet below grade as the trench is backfilled.

### 3.04 THRUST RESTRAINT

- A. Thrust restraint shall be accomplished by using restrained pipe joints for all new pipe. Also, provide concrete thrust blocks where shown or indicated in the Contract Documents. Thrust restraints shall be designed for axial thrust exerted by test pressure



specified in the Buried Piping Schedule at the end of this Section and shall have dimensions as shown where indicated on the drawings.

- B. Place concrete thrust blocks against undisturbed soil.
- C. Restrained Pipe Joints:
  - 1. Pipe joints shall be restrained by means suitable for the type of pipe being installed.
    - a. Ductile Iron, Push-on Joints and Mechanical Joints: Restrain with proprietary restrained joint system as specified in Section 33 05 19, Ductile Iron Pipe; lugs and tie rods; or other joint restraint systems approved by ENGINEER.
    - b. Thermoplastic and HDPE Joints: Where bell and spigot type or other non-restrained joints are utilized, provide tie rods across joint or other suitable joint restraint system, subject to the approval of ENGINEER.
    - c. Joints for Concrete Pipe: Restrain joints utilizing clamp type restrained joint or snap ring-type restrained joint.
- D. Concrete Reaction Blocks:
  - 1. Provide concrete thrust blocks as approved for use by the Engineer, on pressure piping, at tees, plugs, bends and caps, and where shown or indicated in the Contract Documents. Construct thrust blocks of Class D concrete, conforming to 03 30 01, Concrete.
  - 2. Install thrust blocks against undisturbed soil. Place concrete to contain the resultant thrust force so that pipe and fitting joints are accessible for repair.
    - a. Provide reinforcing as is required.
  - 3. Concrete thrust block size shall be as shown on the Drawings or as approved by ENGINEER.
  - 4. No direct payment shall be made for concrete reaction blocking and reinforcement – cost shall be included in the lump sum base bid.

### 3.05 WORK AFFECTING EXISTING PIPING

- A. Location of Existing Underground Facilities:
  - 1. Locations of existing Underground Facilities shown on the Drawings should be considered approximate.
  - 2. Determine the true location of existing Underground Facilities to which connections are to be made, crossed, and that could be disturbed, and determine location of Underground Facilities that could be disturbed during excavation and backfilling operations, or that may be affected by the Work.
- B. Taking Existing Pipelines and Underground Facilities Out of Service:
  - 1. Conform to Section 01 14 16, Coordination with Owner's Operations.

2. Do not take pipelines or Underground Facilities out of service unless specifically listed in Section 01 14 16, Coordination with Owner's Operations, or approved by ENGINEER.
  3. Notify ENGINEER in writing prior to taking pipeline or Underground Facilities out of service. Shutdown notification shall be provided in advance of the shutdown in accordance with the General Conditions and Section 01 14 16, Coordination with Owner's Operations.
- C. Work on Existing Pipelines or Underground Facilities:
1. Cut or tap piping or Underground Facilities as shown or required with machines specifically designed for cutting or tapping pipelines or Underground Facilities, as applicable.
  2. Install temporary plugs to prevent entry of mud, dirt, water, and debris into pipe.
  3. Provide necessary adapters, sleeves, fittings, pipe, and appurtenances required to complete the Work.
  4. Conform to applicable requirements of Section 01 14 16, Coordination with Owner's Operations, Section 01 73 29, Cutting and Patching, and Section 01 73 24, Connections to Existing Facilities.

### 3.06 FIELD QUALITY CONTROL

- A. General:
1. Test all piping, except as exempted in the Buried Piping Schedule in this Section.
  2. When authorities having jurisdiction are to witness tests, notify ENGINEER and authorities having jurisdiction in writing at least 48 hours in advance of testing.
  3. Conduct all tests in presence of ENGINEER.
  4. Remove or protect pipeline-mounted devices that could be damaged by testing.
  5. Provide all apparatus and services required for testing, including:
    - a. Test pumps, compressors, hoses, calibrated gages, meters, test containers, valves, fittings, and temporary pumping systems required to maintain OWNER's operations.
    - b. Temporary bulkheads, bracing, blocking, and thrust restraints.
  6. Provide air if an air test is required, power if pumping is required, and gases if gases are required.
  7. Unless otherwise specified, CONTRACTOR will provide water required for hydrostatic testing. Provide means to convey water for hydrostatic testing into piping being tested. Provide water for other types of testing required.

8. Repair observed leaks and repair pipe that fails to meet acceptance criteria. Retest after repair.
9. Unless otherwise specified, testing shall include existing piping systems that connect with new piping system. Test existing pipe to nearest valve. Piping not installed by CONTRACTOR and that fails the test shall be repaired upon authorization of OWNER. Unless otherwise included in the Work, repair of existing piping or Underground Facilities will be paid as extra Work.

B. Test Schedule:

1. Refer to the Buried Piping Schedule in this Section for type of test required and required test pressure. Perform all tests in the presence of the Engineer.
2. Unless otherwise specified, required test pressures are at lowest elevation of pipeline segment being tested.
3. For piping not listed in Buried Piping Schedule in this Section:
  - a. Hydrostatically test pipe that will convey liquid at a pressure greater than five psig. Provide process air pipe test for pipe that will convey air or gas under pressure or vacuum.
  - b. Use exfiltration testing, low-pressure air testing, or vacuum testing for other piping as required.
  - c. Disinfect for bacteriological testing piping that conveys potable water.
4. Test Pressure:
  - a. Use test pressures listed in Buried Piping Schedule in this Section.
  - b. If test pressure is not listed in Buried Piping Schedule, or if test is required for piping not listed in the Buried Piping Schedule, test pressure will be determined by ENGINEER based on maximum anticipated sustained operating pressure and methods described in applicable ANSI/AWWA manual or standard that applies to the piping system.

C. Hydrostatic Testing:

1. Preparation for Testing:
  - a. Prior to testing, ensure that adequate thrust protection is in place and joints are properly installed.
2. Inspection for Defects of Pipe
  - a. Pipeline shall be visually inspected from each manhole by use of artificial light, reflecting sunlight, closed circuit television cameras, or other devices for visual inspection.
  - b. Pipelines shall exhibit a fully circular pattern when viewed from one manhole to the following manhole.
  - c. If the interior of the pipeline shows poor alignment, displaced or damaged pipe, or any other defect, the defects as designated by the ENGINEER shall be corrected by the CONTRACTOR at no additional cost to the City.

3. Pressure Testing for Water Pipe:
- a. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in pipe being tested.
  - b. Expel air from pipe as required. Obtain approval of ENGINEER prior to tapping pipe for expelling air.
  - c. Examine exposed joints and valves, and make repairs to eliminate visible leakage.
  - d. After specified wetting period, add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.
  - e. Timed test period shall not begin until after pipe has been filled, exposed to required wetting period, air has been expelled, and pressure stabilized.
  - f. Timed Test Period: After stabilization period, maintain test pressure for two hours. During timed testing period, add fluid as required to maintain pressure within five psig of required test pressure. Test pressure shall then remain steady for one hour, indicating no leakage.
  - g. Pump from test container to maintain test pressure. Measure volume of fluid pumped from test container and record on test report. Record pressure at test pump at 15 minute intervals for duration of test.
  - h. Allowable Leakage Rates: Leakage is defined as the quantity of fluid supplied to pipe segment being tested to maintain pressure 150 psi for a period of 2 hours. Allowable leakage rates for 1,000 linear feet of piping are:

Pipe Size (inches)	Allowable Leakage (gallons)
4	0.73
6	1.11
8	1.47

- i. Prior to beginning test confirm all hydrants are properly located, operable, plumb, and at correct elevation, all valves are properly located, operable, and at correct elevation, with valve boxes or manholes centered over wrench nuts, and top of box or manhole at correct elevation and the water line or lines are properly vented where entrapped air is a consideration.

D. Bacteriological Testing:

1. Bacteriological testing for potable water lines, finished water lines, and other piping in accordance with the Buried Piping Schedule, is specified in Article 3.7 of this Section.

### 3.07 CLEANING AND DISINFECTION

A. Cleaning, General: Clean pipe systems as follows:

1. Thoroughly clean all piping, including flushing with water, dry air, or inert gas as required, in manner approved by ENGINEER, prior to placing in service. Flush chlorine solution and sodium hypochlorite piping with water.

2. Piping 24-inch diameter and larger shall be inspected from inside and debris, dirt and foreign matter removed.
3. For piping that requires disinfection and has not been kept clean during storage or installation, swab each section individually before installation with five percent sodium hypochlorite solution.

**B. Disinfection:**

1. Disinfect all potable and finished water piping.
2. Suggested procedure for accomplishing complete and satisfactory disinfection is specified below. Other procedures may be considered for acceptance by ENGINEER.
  - a. Prior to disinfection, clean piping as specified and flush thoroughly.
  - b. Conform to procedures described in ANSI/AWWA C651. Use continuous or tablet feed method of disinfecting, unless alternative method is acceptable to ENGINEER.
3. Water for initial flushing, testing, and disinfection will be furnished by OWNER. Provide all temporary piping, hose, valves, appurtenances, and services required. Cost of water required for re-disinfection will be paid by CONTRACTOR to OWNER at water utility's standard rates.
4. Chlorinate water lines according to the following:
  - a. All water lines or appurtenances added to or replaced shall be properly chlorinated before being placed in service.
  - b. The Contractor under the supervision of the Engineer shall perform the chlorination.
  - c. Any pipe subjected to contaminating materials shall be treated as directed by the engineer. Should such treatment fail to cleanse the pipe, replace the pipe at no cost to the City.
  - d. Perform the chlorination of a completed line in the following manner:
    - 1) Taps will be made at the control valve located in the upstream end of the line and at all extremities of the line. These taps shall be located in such a manner as to allow high-test hypochlorite (HTH) solution to be introduced into all parts of the line.
    - 2) A water solution containing HTH (65%) available chlorine shall be introduced into the line by regulated pumping at the control-valve tap. The solution shall contain a concentration of HTH that will produce a uniform concentration of 100 ppm total chlorine immediately after the introduction of the solution into the line has been completed.
    - 3) The following quantities of 65% HTH compound per 1000 feet of line is required to produce a solution concentration of 100 ppm total chlorine as stated above:

<b>Pipe Size (inches)</b>	<b>65% HTH (Pounds per 1000 feet of line)</b>
4	0.84
6	1.88
8	3.35

- e. The HTH solution shall be circulated in the line by opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution must be pumped into the line at a constant rate for each discharge rate in order that a uniform concentration will be maintained in the line.
  - f. Water laterals shall be sterilized by the Contractor using methods acceptable to the Engineer. Contractor shall bear the same responsibility for water laterals as he bears for water mains and appurtenances, including any costs for corrective measures needed to comply with the bacteriological requirements.
  - g. The HTH Solution shall remain in the lines for a minimum of 24 hours. If directed by the Engineer the HTH solution shall remain in the lines longer than 24 hours. At the end of this period the free chlorine residual shall be a minimum of 10 ppm or the lines shall be re-chlorinated.
  - h. Exercise extreme caution at all times in order to prevent the HTH Solution from entering the existing water system.
5. Bacteriologic tests will be performed by OWNER. Certified test laboratory report will be provided to CONTRACTOR, if requested.

C. Bacteriological Sampling of Water Lines

1. The Engineer or Owner shall collect water samples for bacteriological analysis 24 hours after flushing of the lines is completed. Furnish any reasonable amount of assistance that may be required by the Engineer to secure these samples.
2. If test results are unsatisfactory, immediately re-chlorinate the lines and proceed with such measures as are necessary to secure sterile lines. All laterals shall be re-chlorinated during this process.
3. At the satisfactory completion of the bacteriological requirements, the lines shall be placed into service under the supervision of the Engineer.

### 3.08 SCHEDULES

- A. Schedules listed below, following the "End of Section" designation, are part of this Specification section.
1. Table 33 05 05-A, Buried Piping Schedule.

END OF SECTION

**TABLE 33 05 05-A, BURIED PIPING SCHEDULE**

<b>Service</b>	<b>Diameter (inch)</b>	<b>Material</b>	<b>Interior Lining</b>	<b>Exterior Coating</b>	<b>Pressure Class/ Thickness Class</b>	<b>Joint</b>	<b>Test</b>	<b>Remarks</b>
Sanitary Sewer (SAN)	8 – 48	DI	Protecto 401	AC, PEW	250 / 53	POJ / Flg	HYD (15)	

## A. Service Abbreviations

<b>Service</b>	<b>Abbrev</b>	<b>Service</b>	<b>Abbrev.</b>
Storm Sewer	ST		
Raw Water	RW		
Potable Water	PW		
Non-Potable Water	NPW		
Plant Effluent Water	PEW		
Influent	INF		
Effluent	EFF		
Drain	DR		

## B. Material Abbreviations

<b>Material</b>	<b>Abbrev</b>	<b>Material</b>	<b>Abbrev.</b>
Ductile Iron	DI	Polyvinyl Chloride	PVC
Cast Iron	CI	Chlorinated Polyvinyl Chloride	CPVC
Carbon Steel	CS	Polyethylene	PE
Stainless Steel	SS	High Density Polyethylene	HDPE
Reinforced Concrete Pipe	RCP	Vitrified Clay	VC

## C. Lining/Coating Abbreviations

<b>Lining</b>	<b>Abbrev</b>	<b>Coating</b>	<b>Abbrev.</b>
Cement Mortar Lined	CL	Asphaltic Coated	AC
Glass Lined	GL	Polyethylene Wrapped	PEW
Ceramic Epoxy	CE	Painted	P

## D. Joint Abbreviations

<b>Joint Type</b>	<b>Abbrev</b>	<b>Joint Type</b>	<b>Abbrev.</b>
Bell and Spigot	BS	Butt Weld	BW
Restrained Bell and Spigot	RBS	Lap Weld	LW
Push-on Joint	POJ	Butt Fusion Weld	BFW
Restrained Push-on Joint	RPOJ	Solvent Weld	SW
Mechanical Joint	MJ	Sleeve-type Flexible Coupling	SLFC
Restrained Mech. Joint	RMJ	Split Flexible Coupling	SPFC
Soldered	Sd	Plasticized PVC Coupling	PPVC
Brazed	Bz	Grooved or Shouldered End Coupling	GSEC
Threaded	Thd	Flanged	Flg
Compression Sleeve Coupling	CSC	Compression Flange Adapter	CFA



## E. Test Abbreviations

<b>Test</b>	<b>Abbrev</b>		<b>Test</b>	<b>Abbrev.</b>
Hydrostatic Test (test pressure in psig)	HYD ( )		Process Air Pipe Test (test pressure in psig)	PA ( )
Exfiltration	EX			
Low-pressure Air Sewer Test	AIR		Disinfection and Bacteriological Testing	DBT
Vacuum Test	VAC		Examination of Welds	EW
Vertical Deflection	VD		No Test Required	NR
Televised Inspection	TV			

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## PART 1 GENERAL

### 1.01 DESCRIPTION

A. Scope:

1. Provide all labor, materials, equipment, and incidentals required to install and test ductile iron pipe and fittings for yard piping as shown on the Drawings and as specified herein.
2. Yard piping shall include all piping and fittings extending outward, upward and downward into the ground from the outside face of all buildings. Unless otherwise noted, non-buried pipe outside a building, including in utility tunnels, shall be specified in Division 33. Yard piping shall begin at the outside face of the buildings. The first joint shall be not more than 2 feet from the outside face of the building or structure unless otherwise shown on the Drawings. Yard piping shall include all piping in valve vaults, manholes, cleanouts and similar yard structures.
3. Extent of piping is shown on the Drawings. Piping schedules in Section 33 05 05, Buried Piping Installation, specify pipe service, diameter, material, lining, coating, pressure rating, joint type, and testing required.
4. All fittings including; plugs, caps, tees, and bends, unless otherwise specified, shall be provided with concrete reaction blocking, Meg-A-Lug type restraint systems or suitably restrained joints as indicated on the drawings or as directed by the ENGINEER.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before ductile iron pipe Work.

C. Related Sections:

1. Section 31 23 33, Trenching and Backfilling.
2. Section 33 05 05, Buried Piping Installation.

### 1.02 REFERENCES

A. Standards referenced in this Section are:

1. ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series.
2. ANSI B18.2.2, Square and Hex Nuts. (Inch Series).
3. ASTM A193, Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service.

4. ASTM A194, Specification for Carbon Steel and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
5. ASTM A536, Standard Specifications for Ductile Iron Castings.
6. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
7. ASTM G62, Test Methods for Holiday Detection in Pipeline Coatings.
8. 17ANSI/AWWA C104, Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
9. ANSI/AWWA C110, Ductile Iron and Gray Iron Fittings for Water.
10. ANSI/AWWA C111, Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
11. ANSI/AWWA C116, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Service.
12. ANSI/AWWA C151, Ductile Iron Pipe, Centrifugally Cast, for Water.
13. ANSI/AWWA C153, Ductile Iron Compact Fittings, 3 inch through 24 inch and 54 inch through 64 inch for Water Service. ANSI/AWWA C153, Ductile-Iron Compact Fittings for Water Service.
14. ANSI/AWWA C606, Grooved and Shouldered Type Joints.
15. MSS-SP 60, Connecting Flange Joint Between Tapping Sleeves and Tapping Valves.
16. NACE RP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
17. NSF/ANSI 61, Drinking Water System Components - Health Effects.

## 1.03 QUALITY ASSURANCE

### A. Qualifications:

1. Manufacturer:
  - a. Manufacturer shall have a minimum of five years' successful experience producing ductile iron pipe and fittings and shall be able to show evidence of at least five installations in satisfactory operation in the United States that are similar applications to the specified service.
  - b. Lining and coating products shall be manufactured by a firm with a minimum of five years' successful experience in protecting pipelines exposed to the specified service conditions, and shall be able to show evidence of at least five installations in satisfactory operation in the United States that are similar applications to the specified service.

- c. When not applied by the manufacturer, lining and coating Subcontractor shall have a minimum of five years' successful experience in the application of the specified linings and coatings for similar applications for the specified service, and shall be able to show evidence of at least five installations in satisfactory operation in the United States.
- B. Supply and Compatibility:
1. Ductile iron pipe manufacturer shall review and approve or prepare all Shop Drawings and other submittals for pipe, fittings, and appurtenances furnished under this Section.
  2. Pipe, fittings, and appurtenances shall be suitable for the specified service and shall be integrated into overall piping system by ductile iron pipe manufacturer.
  3. Ductile iron pipe manufacturer shall be responsible for all products and all factory-applied linings and coatings, whether installed at pipe manufacturer's facility or at manufacturer's Supplier's facility.
  4. As an alternative to Class 250 iron fittings Contractor may supply Class 350 ductile iron compact fittings. Thickness of Class 350 fittings shall be equal to or exceed 350 psi working pressure and conform to with ANSI/AWWA C153/A21.53. Compact fittings shall conform to ASTM A536, minimum grade 70-50-05. The thickness class shall be equal or exceed 350 psi.
- C. Regulatory Requirements:
1. Pipe and fittings, including linings and coatings, that will convey potable water or water that will be treated to become potable, shall be certified by an accredited organization in accordance with NSF/ANSI 61 as being suitable for contact with potable water, and shall comply with requirements of authorities having jurisdiction at Site.

## 1.04 SUBMITTALS

- A. Action Submittals: Submit the following with Shop Drawings required under Section 33 05 05, Buried Piping Installation, and Section 33 05 07, Exposed Piping Installation:
1. Shop Drawings:
    - a. Detailed drawings and data for pipe, fittings, gaskets, appurtenances, linings, and coatings.
  2. Product Data:
    - a. Surface preparation and application reports and procedures as required for lining and coating of pipe and fittings. Ductile iron pipe and fitting manufacturer and manufacturer and applicator of lining and coating, as specified, shall mutually determine recommended surface preparation and application methods, and provide written verification of mutually selected method in the submittals.
- B. Informational Submittals: Submit the following:

1. Certificates:
  - a. Submit certificate signed by manufacturer of each product that product conforms to applicable referenced standards and the Contract Documents.
  - b. Submit certificate signed by applicator of the linings and coatings stating that product to be applied conforms to applicable referenced standards and that the applicator shall conform to the Contract Documents.
2. Source Quality Control Submittals:
  - a. Submit results of specified shop tests for pipe, fittings, linings, and coatings.
  - b. Lining and coating test coupons.

## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Refer to Section 33 05 05, Buried Piping Installation, and Section 33 05 07, Exposed Piping Installation.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. General:
  1. Piping systems shall be suitable for their intended use.
  2. Joints shall be as specified in Section 33 05 05, Buried Piping Installation. If not specified, provide flanged joints for exposed piping and push-on joints for buried piping.
- B. Ductile Iron Pipe, Joints, and Fittings:
  1. Flanged Pipe: Fabricate in accordance with ANSI/AWWA C115.
    - a. Pressure Rating: As specified in piping schedule in Section 33 05 05, Buried Piping Installation. If not otherwise specified, use Special Thickness Class 53 for 3-inch to 54-inch diameter pipe and Pressure Class 350 for 60-inch and 64-inch diameter pipe.
  2. Non-Flanged Pipe: Conform to ANSI/AWWA C151 for material, pressure, dimensions, tolerances, tests, markings, and other requirements.
    - a. Pressure Class: As specified in piping schedules in Section 33 05 05, Buried Piping Installation and Section 33 05 07, Exposed Piping Installation. If not otherwise specified, use Pressure Class:
      - 1) Water Pipe 3-inch to 12-inch designed in accordance with ANSI A21.50 for working pressure 350 psi, and Laying Condition 1.
      - 2) Water Pipe 16-inch or larger designed in accordance with ANSI A21.50 for working pressure of 250 psi, and Laying Condition 2.
    - b. Special Thickness Class: As specified in piping schedules in Section 33 05 05, Buried Piping Installation. If not otherwise specified use pipe design in accordance with ANSI A21.50 and ASNI A21.51.

- c. Pipe Lining: As specified in piping schedules. If not otherwise specified, use cement mortar with a seal coat of bituminous material, all in accordance with ANSI A21.4.
3. Pipe Joints:
- a. Flanged Joints: Conform to ANSI/AWWA C110 and ANSI/AWWA C111 capable of meeting the pressure rating or special thickness class, and test pressure specified in piping schedule in Section 33 05 07, Exposed Piping Installation.
- 1) Gaskets: Unless otherwise specified, gaskets shall be at least 1/8-inch thick, ring or full-face as required for the pipe, of synthetic rubber compound containing not less than 50 percent by volume nitrile or neoprene, and shall be free from factice, reclaimed rubber, and other deleterious substances. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
  - 2) Bolts: Comply with ANSI B18.2.1.
    - a) Exposed: ASTM A307, Grade B.
    - b) Buried or Submerged: ASTM A193, Grade B8M, Class 2, Heavy hex, Type 316 stainless steel.
  - 3) Nuts: Comply with ANSI B18.2.2.
    - a) Exposed: ASTM A563, Grade A, Heavy hex.
    - b) Buried or Submerged: ASTM A194, Grade B8M, Heavy hex, Type 316 stainless steel.
- b. Mechanical Joints: Comply with ANSI/AWWA C111 and ANSI/AWWA C151, capable of meeting pressure rating or special thickness class, and test pressure specified in piping schedules in Section 33 05 05, Buried Piping Installation, and Section 33 05 07, Exposed Piping Installation.
- 1) Glands: Ductile iron.
  - 2) Gaskets: Plain tip.
  - 3) Bolts and Nuts: High strength, low alloy steel.
  - 4) Manufacturers: Provide products of one of the following:
  - 5) Clow Water Systems Company
  - 6) Atlantic States Cast Iron Pipe Company
  - 7) Canada Pipe Company, Ltd.
  - 8) McWane Cast Iron Pipe Company
  - 9) Pacific States Cast Iron Pipe Company
  - 10) Griffin Pipe Products Co.
  - 11) American Cast Iron Pipe Co.
  - 12) U.S. Pipe and Foundry Co.
  - 13) Or equal.
- c. Push On Joints: Comply with ANSI/AWWA C111 and ANSI/AWWA C151, capable of meeting pressure class or special thickness class, and test pressure specified in piping schedules in this Section, Section 33 05 05, Buried Piping Installation, and Section 33 05 07, Exposed Piping Installation.
- 1) Gaskets: Vulcanized SBR, unless otherwise specified.
  - 2) Stripes: Each plain end shall be painted with a circular stripe to provide a guide for visual check that joint is properly assembled.
  - 3) Products and Manufacturers: Provide one of the following:

- a) Tyton or Fastite Joint by Clow Water Systems, Atlantic States Cast Iron Pipe Company, Canada Pipe Company, Ltd., McWane Cast Iron Pipe Company, Pacific States Cast Iron Pipe Company, and Griffin Pipe Products Company.
  - b) Fastite Joint by American Cast Iron Pipe Company.
  - c) Tyton Joint by U.S. Pipe and Foundry Company.
  - d) Or equal.
- d. Restrained Joints: Restraint for push-on joint pipe and mechanical joint pipe shall be positive locking "Locked-type" joints manufactured by the pipe and fitting manufacturer that utilize restraint independent of the joint gasket. Restrained joints shall be capable of being deflected after full assembly. Field cuts of restrained pipe are not allowed without approval of ENGINEER. If field cuts to accommodate bends are pre-approved by ENGINEER, restraint may be accomplished by mechanical joint bends using methods and products noted below.
- 1) Products and Manufacturers: Provide restrained joints for buried piping 4" through 16" rated 350 psi and 18" through 48" rated 250 psi by one of the following:
    - a) Flex-Ring, by American Cast Iron Pipe Co.
    - b) TRFlex or MJ Harness-Lok, by US Pipe.
    - c) Or pre-approved equal.
4. Flanged and Push-On Joint Fittings: Comply with ANSI/AWWA C110 and ANSI/AWWA C111.
- a. Material: Ductile iron.
  - b. Pressure rating, gaskets, bolts, and nuts shall be as specified for flanged joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of the connected pipe.
5. Mechanical Joint Fittings: Comply with ANSI/AWWA C110 and ANSI/AWWA C111 and ANSI A21.4.
- a. Material: Ductile iron.
  - b. Glands: Ductile iron.
  - c. Pressure rating, gaskets, bolts, and nuts shall be as specified for mechanical joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of connected pipe.
  - d. Restraint for mechanical joint fittings shall be wedge action retainer glands, as manufactured by: EBAA – Megalug Series 1100, or equal.
- C. Interior Lining:
1. Where specified in piping schedules included with Section 33 05 05, Buried Piping Installation, pipe and fittings shall be lined with bituminous seal coated cement mortar lining in accordance with ANSI/AWWA C104.
  2. When lining is not specified for piping provide cement-mortar with a seal coat of bituminous material in accordance with ANSI A21.4.
  3. Where specified in the piping schedule, pipe and fittings shall be lined with a ceramic-filled amine-cured epoxy, Protecto 401 by Induron. The lining thickness shall be a minimum of 40 mils. Application shall be performed by an applicator



approved by the coating manufacturer, in accordance with the manufacturer's instruction.

D. Specials:

1. Transition Pieces:

- a. Provide suitable transition pieces (adapters) for connecting to existing piping.
- b. Unless otherwise shown or indicated, expose existing piping to determine material, dimensions, and other data required for transition pieces.

## 2.02 MARKING FOR IDENTIFICATION

A. In addition to identification markings specified in Section 33 05 05, Buried Piping Installation, also stamp, mark, and identify push-on joint and mechanical joint pipe with:

1. Name or trademark of manufacturer.
2. Weight, class or nominal thickness, and casting period.
3. Country where cast.
4. Year the pipe was produced.
5. Letters "DI" or "Ductile" shall be cast or metal stamped

B. In addition to identification markings specified in Section 33 05 05, Buried Piping Installation, also stamp, mark, and identify flanged pipe with:

1. Flange manufacturer's mark, size, and letters "DI" cast or stamped on the flanges.
2. Fabricator's mark if other than flange manufacturer.
3. Length and weight.

C. In addition to identification markings specified in Section 33 05 05, Buried Piping Installation, also stamp, mark, and identify fittings with:

1. Manufacturer's identification.
2. Pressure rating.
3. Nominal diameters of openings.
4. Country where cast.
5. Number of degrees or fraction of the circle on bends.
6. Letters "DI" or "Ductile" cast on them.

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## 2.03 EXTERIOR SURFACE PREPARATION AND COATINGS

### A. General Coating Requirements:

1. Coating types are specified in piping schedules in Section 33 05 05, Buried Piping Installation.

### B. Exposed Pipe and Fittings:

1. Surface Preparation:
  - a. Initial Surface Inspection: Pipe and fitting manufacturer and coating applicator shall inspect surface to be coated and mutually determine recommended NAPF 500-03 surface preparation method.
  - b. Surface Preparation: Prepare surface in accordance with recommended NAPF 500-03 method.
  - c. Finished Surface Inspection: Prepared surfaces shall be inspected by coating applicator prior to application to determine acceptability of finished surface. If surface is unacceptable, repeat surface preparation and re-application as necessary.
2. After recommended surface preparation, prime coat exterior ferrous metal surfaces of pipe and fittings in the shop.

### C. Buried Pipe and Fittings:

1. Asphaltic Coating: Where specified in piping schedule in Section 33 05 05, Buried Piping Installation, coat pipe and fittings with an asphaltic coating approximately one-mil thick, in accordance with ANSI/AWWA C151, ANSI/AWWA C115, ANSI/AWWA C110, and ANSI/AWWA C153, as applicable.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Inspect piping to assure that piping is free from defects in material and workmanship. Verify compatibility of pipe, fittings, gaskets, linings, and coatings.

### 3.02 INSTALLATION AND FIELD QUALITY CONTROL

- A. For buried piping installation and testing, refer to Section 33 05 05, Buried Piping Installation.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, equipment, materials and incidentals required and install carrier pipe and sleeve by pipe jacking or jack and bore methods under railroads at the one location shown on the Drawings. The work shall be done in strict accordance with the requirements of Norfolk Southern Corporation (NSC), as shown on the Drawings and as specified herein and in accordance with all Federal, State, and Local laws, regulations, and requirements.
- B. Furnish all labor, materials, equipment and incidentals required and perform tunnel backfill after the installation of carrier pipes inside the trenchless crossings, as shown on the Drawings and as specified herein.
- C. Jacking operation shall not impede the flow of traffic along the railroad being crossed.
- D. The Contractor shall familiarize himself/herself with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work. The omission of any details, which may not appear herein, for the satisfactory installation of the work in its entirety, shall not relieve the Contractor of full responsibility.
- E. Continuously keep the entry pit and exit pit subgrade free from groundwater and surface water during the operation and shall be prepared to implement additional groundwater control on short notice as directed by the Engineer. Observed water levels prior to construction are to be 2-ft below the invert elevation of the entry and exit pits.
- F. Prepare to work at night and on Saturday and Sunday, if required to complete the work. After the operation has begun, work continuously (24 hours a day) until the complete length of pipe has been installed.
- G. If any movement or settlement of existing structure, railroad, roadway or utility exceed the threshold values as defined in Section 31 09 00, remediation measures shall be taken to limit any further movement. If movement or settlement exceeding the limiting values occurs, or damage to an existing structure, railroad or road over, along or adjacent to the work is observed, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume jacking only after all necessary precautions have been taken to prevent further movement, settlement or damage, and repair the damage at the Contractor's own cost and to the satisfaction of the Engineer. Conform with all requirements of the Norfolk Southern Corporation permit for work within NSC right-of-way.
- H. No rescue pits shall be allowed.

## 1.02 RELATED WORK

- A. Geotechnical Instrumentation is included in Section 31 09 00.
- B. Earthwork is included in Section 31 23 00.
- C. Dewatering and Drainage is included in Section 31 23 19.
- D. Excavation Support and Protection is included in Section 31 75 01.

## 1.03 SUBMITTALS

- A. Shop Drawings: Submit shop drawings, method statements, equipment and product data for materials to be used for tunneling operations, carrier pipe installation and backfilling. The submittal shall specifically include the following and shall be signed and sealed by the Contractor's Professional Engineer:
  - 1. Locations, dimensions, elevations and details of the entry and exit pits and casing.
  - 2. Equipment and procedures of the tunneling operations.
  - 3. Control of groundwater and surface drainage.
  - 4. Method of face excavation.
  - 5. Method of pit support.
  - 6. Method of excavation removal.
  - 7. Maintenance of alignment and grade.
  - 8. Materials and installation of casing and carrier pipes.
  - 9. Grouting outside of casing, as required, including method of grouting, grout mix design, grout mixing and batching methods, maximum grout pressure and maximum grout volume.
  - 10. Backfilling of the annular space between casing and carrier pipes.
    - a. For grout backfill, include grout mix design, maximum grout pressure, calculations for preventing floatation and deformation of the carrier pipe and maximum grout volume. Submit also methods to prevent damage to pipe joints caused by excessive heat during curing.
    - b. For sand backfill, include gradation test, methods to completely fill all voids, equipment and pressure to be applied.
  - 11. Methods for ensuring that the entire annular void is completely filled without displacing the carrier pipe.
  - 12. Bulkheads design and temporary support of the carrier pipe inside the casing.

- B. Design Calculations: Submit design calculations detailing equipment and construction methods to be used for pipe jacking operations as specified herein and as shown on the contract drawings. Design calculation shall include, but not limited to, anticipated jacking load and casing pipe deformation, calculations for preventing floatation and deformation of the carrier pipe during backfill grouting to fill annular space between the carrier pipe and casing pipe.
- C. Submittal for backfill grouting shall include:
1. Means and method for proportioning, mixing, batching and delivering backfill, including storage of raw materials.
  2. Method statements and design calculations for placing backfill materials, including initial lift heights of backfill, rate of placement based upon maximum height of backfill allowed prior to set to prevent overloading of the carrier pipe.
  3. Details for transporting and placing backfill. Describe the sequencing of this work with the installation of the carrier pipe.
  4. Drawings showing details of grout delivery pipes, slicklines, injection ports, bulkheads, vent outlets, and other materials.
  5. Methods for blocking or bracing the carrier pipes during backfilling.
  6. Details of pumping pressures and rates, placement sequences and volumes, lift thicknesses, including theoretical quantity for each placement.
  7. Methods for handling the backfill materials prior to placing the backfill within the annulus, including agitators, remixer or other equipment.
  8. Methods for maintaining uniformity of the backfill elevation around the carrier pipe.
  9. Written certification from the carrier pipe manufacturer that the pipe is capable of handling the proposed pumping and hydrostatic pressures, and heat generated during hydration from annular backfill material.
- D. Submit the Contractor's qualifications as described herein.
- E. Submit the Contractor's Tennessee professional engineer's qualifications as described herein
- F. Daily surveyor reports of casing pipe position and control point monitoring (in accordance with NSC Railroad requirements), conducted by the Contractor's surveyor, shall be provided in writing to the Engineer.
- G. For crossings within NSC Railroad right-of-ways, the Contractor's Tennessee professional engineer shall certify the shoring of all excavations as adequate to prevent damage to the railroad.

- H. Acceptance of the submitted material by Engineer does not indicate acceptance of responsibility for the means and methods of construction. The Contractor shall be totally responsible for the entire jacking operation.

## 1.04 REFERENCE STANDARDS

### A. ASTM International

1. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
3. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
4. ASTM C150 - Standard Specification for Portland Cement.
5. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

### B. American Water Works Association (AWWA)

1. AWWA C200 - Steel Water Pipe 6-in (150mm) and Larger.
2. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied.
3. AWWA C206 - Field Welding of Steel Water Pipe.

### C. American Welding Society (AWS)

- D. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 DEFINITIONS

- A. Pipe Jacking shall mean the use of thrust shield with hydraulic jacks pushing against the casing pipes with hydraulic jacks located in the entry pit.
- B. Jack and Bore shall mean the use of hydraulic jacks pushing against the casing pipes with hydraulic jacks located in the entry pit. The excavation of the soil is accomplished by a rotating cutting head inside the leading edge of the casing. The ground up soil (spoil) is transported back to the entry pit by helical wound auger flights rotating inside the casing.
- C. Casing pipe shall mean the outer steel sleeve that is installed by jacking method.
- D. Carrier pipe shall mean the pipe inserted within the casing pipe and which acts as the conveyor for sanitary sewer flow.

- E. Entry pit shall mean the pit in which the jacking equipment is installed and from which both the casing pipe and carrier pipe are launched.
- F. Exit pit shall mean the pit at the point where the casing and carrier pipes emerge.

## 1.06 QUALITY ASSURANCE

- A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State, and local agencies.
- B. The Contractor shall have at least five 5 years experience with compatible work to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work. Compatible work shall include pipe jacking of at least 60-inch-diameter by at least 150-foot-long casings below railroads. A minimum of three (3) projects performed within the past five (5) years shall be presented including date of project, location, excavation type, responsible personnel, client and contact address and phone number, size of job in dollars, and performance.
- C. The Contractor's engineer shall be a professional engineer, registered in the State of Illinois, and shall have at least 5 years experience in the design of pipe jacking, excavation support, dewatering, grouting, and soil stabilization.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. 60-in O.D. steel casing pipe shall have a minimum yield strength of 35,000 psi, have a 0.844-in minimum wall thickness as shown on the Drawings, be equipped with grout holes as specified herein, be designed to withstand Cooper's E-80 railroad loading where it crosses under railroad tracks in addition to the jacking forces during construction and conform to ASTM A53. Steel sleeves shall be painted inside and outside with two coats bitumastic enamel coating paint in accordance with AWWA C203.
- B. Steel pipe casing shall be furnished in lengths of the Contractor's choice. The casing shall have beveled ends with a single v-groove and shall be field joined by full-penetration butt welding all around prior to jacking. Butt welding shall be performed in accordance with applicable portions of AWWA C206 and AWS D7.0. The welded joints shall be wire brushed and painted with bitumastic enamel coating in accordance with AWWA C203. Alternatively, Permalok connectors may be used.
- C. Steel pipe casing shall have 2-inch grout holes such that grout ports are provided at 10-foot-maximum intervals along the length of the completed tunnel. The grout holes shall be spaced at 120 degrees on center (three holes at each interval) orientated with one hole at the crown. Two-inch steel half-couplings shall be welded over the holes in the pipe casing, and shall have threaded steel plugs.
- D. For pipe jacking operation, the tunnel face support shall be designed to support all applicable surcharge loading, including pressures from earth, groundwater, traffic and equipment, in addition to other loadings imposed.

- E. Fusion bonded epoxy carbon steel casing spacers shall be provided. Acceptable manufacturers include the following:
  - 1. Advanced Products & Systems, P.O. Box 60399, Lafayette, LA 70578, T: 337-233-6116,
  - 2. Cascade Waterworks Mfg. Co., 1213 Badger St., Yorkville, IL 60560, T:630-553-0840, or
  - 3. Approved equal.
- F. Bulkheads shall be provided to seal the space between the carrier pipe and casing pipe at each end of the tunnel for annular backfill containment. Bulkheads may be of masonry (minimum 8 inches thick).
- G. Lubricant for decreasing jacking friction between the jacked casing pipe and earth shall be bentonite slurry or similar commercial product.

## 2.02 MIX DESIGN

- A. Grout for pressure injection between the casing and the earth where it shown shall be a mixture of Portland cement and bentonite or similar commercial product that shall harden to a minimum compressive strength of 500 psi. The grout shall be readily pumpable. The shop drawings shall include both the proposed grout and the pumping system.
- B. Cement grout used to fill the space between the casing and the carrier pipes shall consist of a mixture of about 1-part cement to 6 parts sand which shall be subject to increase or decrease in the amount of cement necessary, as determined by the Engineer, to provide good flowing characteristics. Cement grout shall have a minimum pH of 12 and shall be free of fly ash.

## PART 3 EXECUTION

### 3.01 ENTRY AND EXIT PITS

- A. Refer to Section 02311 - Excavation Support and Protection for pit requirements.
- B. Trench boxes and trench shields shall not be used as support of excavation for any entry or exit pit unless approved by the Engineer.
- C. Furnish, install and remove, to the extent required, thrust blocks or whatever provisions may be required in driving the casing pipes.
- D. The entry and exit pits at the NSC Railroad shall also be designed to protect any existing utilities within the railroad right-of-way.



### 3.02 JACKING OPERATIONS

- A. Coordinate the pipe jacking operation with Norfolk Southern Corporation. Arrange for flaggers and safety observer as required.
- B. The casing pipe under existing railroad where so shown shall be installed to the limits shown in accordance with the approved encroachment agreement or permit. The length of the casing may be extended for the convenience of the Contractor, at no additional cost to the Owner.
- C. The Contractor shall provide all material, equipment, and facilities required for installing, positioning, and jacking the casing pipe.
- D. The Contractor shall be fully responsible for preventing the occurrence of voids outside the casing pipe and if they occur, fill them with cement grout.
- E. The casing pipe at each location shown on the Drawings shall be jacked in one continuous 24-hour-per-day operation unless approved by the Engineer. In no event shall jacking or lubricant injection be discontinued for sufficient period to cause the partially jacked sleeve to "freeze" in place.
- F. Proper alignment and elevation of the casing pipe shall be consistently maintained throughout the jacking operation. Tolerances for installation of the casing pipe from the location shown shall be as follows:
  - 1. Vertical- plus or minus 3 inches per 100 feet of length and no more than 0.50 feet total. Horizontal- plus or minus 3 inches per 100 feet of length.
- G. Jacking shall not commence until the Contractor's surveyor has verified in writing to the Engineer that the first pipe casing segment is at the correct location and elevation and is oriented at the correct horizontal and vertical direction. After the first segment has been jacked forward, the Contractor's surveyor shall again verify in writing to the Engineer that alignment is correct. If alignment is not correct at this point, or any successive point, the jacked casing operation shall be stopped and shall not resume until the Contractor has modified the jacking operation as required to maintain proper alignment at no additional cost to the Owner.
- H. Establish survey station marks over the entire length of the jacked casing during jacking operations at intervals of not more than 20 feet and to an accuracy of 0.01 feet.
- I. If alignment or elevations exceed the specified tolerances during the jacking operations as indicated by survey reports, the Contractor shall report the situation to the Engineer immediately. The jacked casing operation shall be stopped and shall not resume until the Contractor has submitted to and accepted by the Engineer a modified jacking operation as required to restore and maintain proper alignment. The modified operations shall be implemented at no additional cost to the Owner.
- J. Jacking shall not commence until the Contractor has installed, initialized, and is prepared to record readings from all geotechnical instrumentation as required by Section 31 09 00.

- K. Removal of material from the casing face shall be by hand-mining or augering. The jacking shield shall be of steel construction with an open face shield and the appropriate configuration to allow for the installation of a breasting system. The breasting system should be removable and replaceable in the event that obstructions are encountered. An auger and cutting head may be utilized in lieu of hand-mining for soil removal during pipe jacking. The auger and cutting head arrangement shall not extend past the leading edge of casing and a soil plug shall be maintained inside the casing at all times to reduce the potential for soil loss above the casing during jacking. The auger and cutting head shall be removable from the pipe in the event an obstruction is encountered.
- L. Immediately following the jacking operation, pressure grout the jacked section to fill all voids existing outside of the jacked casing. Grouting shall be from the interior of the casing through grouting holes.
- M. The Contractor shall excavate only from within the casing to minimize the volume of the voids outside the jacked casing pipe, and to minimize raveling of the soils at the face. The Contractor shall constantly exercise care in the removal of the excavation.
- N. If an obstruction is encountered during the boring operation, the auger shall be withdrawn, the excess casing pipe cut off, capped and the interior and exterior voids shall be completely filled with 1:3 Portland cement grout under pressure. No separate payment shall be made for unsuccessful bores.
- O. Groundwater shall be controlled at all times. If groundwater is expected to be above or within the casing level, a groundwater control system consisting of vertical or horizontal wells or well points shall be installed and operated such that the groundwater level is lowered to the invert level at the face. Groundwater control along and at the face of the casing pipe shall include grout stabilization as required. Dewatering design and operations shall be in accordance with Section 31 23 19.
- P. The Contractor shall be required to use a jacking ring consisting of either steel or concrete construction. This jacking ring will allow the jacking pressure to be distributed evenly around the wall of the jacking pipe.
- Q. The use of a jacking frame shall be required. It shall be fabricated from structural steel members and shall be designed to distribute the stresses from the jacks evenly to the jacking ring.
- R. The Contractor shall use thrust blocks adequately designed to carry the thrust of the jacks to the soil without excessive soil deflection and in such a manner as to avoid any disturbance of adjacent structures or utilities and to jack the casing reliably in the correct alignment. Refer to Section 31 75 01 for thrust block design requirements.
- S. Jacking pressures used shall be uniformly distributed through the jacking frame and parallel to the axis of the pipe. Extreme care shall be taken so that crushing or other damage to the joints of the casing pipe will not occur.
- T. The Contractor shall have a redundant lubricant injection system connected for immediate use in the event the primary system fails during the jacking operation. Lubricant injection shall be continuous until the casing is fully installed.

- U. The alignment of the casing pipe shall be checked at least daily by the Contractor's surveyor as the casing progresses and daily written reports provided to the Engineer. Adjustments shall be made immediately if any misalignment occurs.
- V. If work is stopped for any reason, the exposed face of the excavation shall be fully protected with a bulkhead satisfactory to the Engineer.
- W. After the sleeve has been completely installed, thoroughly clean the interior. Place within the sleeve, the pipe using wooden skids bound together with steel banding as shown on the Drawings.
- X. After the pipe is installed with the sleeve and prior to the placement of sand fill, conduct a leakage test on pipe as designated by the Engineer. Any leaks which are discovered during the testing phase shall be repaired to the satisfaction of the Engineer. The carrier pipe shall not be installed until leakage into the casing pipe, after removal of all dewatering pumping systems, does not exceed 20 gallons per hour/100 linear feet of finished casing pipe.
- Y. The carrier pipe shall not be direct jacked.
- Z. The Contractor shall be responsible for damages resulting from subsidence, collapsed casings, or ground losses into the jacked pipe casing and for the refilling of voids resulting there from with grout. Where such ground losses are so severe that they result in damage to underground or surface pavement, railroad, existing utilities or structures, the Contractor shall be solely responsible for remedying such damage. Where the filling of voids cannot be effectively carried out from below, the Engineer reserves the right to order the Contractor, at no additional cost to the Owner, to make openings from the surface for the purpose of backfilling the voids. If in the judgment of the Engineer, a portion of the casing and/or pipe requires reinforcing because of such collapse, the Engineer may direct the Contractor to furnish and place such reinforcement at no additional cost to the Owner. Reinforcement may also be directed when the stability of the soil adjacent to the casing and/or pipe has been affected by the loss of ground.
- AA. Maximum allowable deflection of the inside diameter of the casing in any direction from a true circle shall be 1.0 percent of the inside diameter. Deflection shall be measured at not more than 50-foot-intervals.

### 3.03 ANNULUS GROUTING

- A. The void between the casing pipes and the earth shall be grouted as the casing installation progresses. Grout shall be forced under pressure into the grouting connections. Grouting shall be performed from the interior of the casing pipe. Grouting shall be started in the lowest connections and shall proceed until grout begins to flow from upper connections.
- B. Apparatus for mixing and placing grout shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous, uninterrupted flow.

- C. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable devices until the grout has set sufficiently in the judgment of the Engineer, or for a minimum of 24 hours, whichever is longer. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.
- D. Grout pressure shall not exceed one-half of the existing overburden pressure.
- E. Apparatus for mixing and placing grout shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.
- F. After grouting is complete, pressure shall be maintained by means of stop cocks or other suitable devices until the grout has set sufficiently according to the Engineer's judgment, or 24 hours, whichever is longer. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

### 3.04 CARRIER PIPELINE INSTALLATION IN CASING

- A. After the casing has been completely installed, thoroughly clean the interior.
- B. After casing pipe installation is complete and found acceptable by the Engineer, the Contractor shall install the carrier pipe to the line and grade of the pipe as shown on the drawings using methods approved by the Engineer.
- C. If metal rails are used, the rails shall be embedded in concrete and shall in no way be connected to or touching the casing pipe.
- D. The pipes shall be supported securely at increments that prevent deflection of the carrier pipe and the pipe does not slide directly on the grade control structure. Under no conditions will pipe transport equipment that places any load on the interior of the preceding pipe section be allowed, nor will sliding the pipe directly on rails be allowed.
- E. Each pipe segment shall be blocked against the casing pipe to prevent displacement during grouting.
- F. Carrier pipe joints shall be tested immediately after installation per the appropriate pipe specification. Block pipe as necessary to prevent joint separation during testing. There shall be no exceptions to this requirement.

### 3.05 CASING ANNULUS BACKFILL

- A. After the carrier pipe has been installed in the casing, all void spaces outside of the carrier pipe shall be completely filled. Pipe crossings shall be backfilled with cement grout. Backfill material shall be pumped into all irregularities around the carrier pipe to completely fill the annulus with structural grout to the maximum extent possible. Backfill method shall not cause abrasion or damage to the carrier pipe or pipe joints. Vent pipes shall be placed at high areas of the crown to provide for venting of entrapped air and water.

- B. Contractor shall verify that location where backfill is to be placed are clean and free of standing or running water.
- C. Bulkheads shall be constructed at the ends of casing pipe to be backfilled. Bulkheads shall incorporate a minimum 1-inch drain pipe in the invert and crown of the casing to facilitate drainage of water and air during backfilling. The pipes shall be securely capped and plugged once annular backfill material begins to flow from the drain line.
- D. Methods for verifying complete filling the annular space between the pipe and the surrounding ground or initial support shall be acceptable to the Engineer. No standing water shall be allowed where backfill is placed.
- E. Backfill shall be placed though piping installed in the crown of the casing pipe. Backfill placement location shall be spaced no further than 50 feet apart.
- F. The limits of each backfill placement stage shall be predetermined by the size and capacity of the batching equipment and the initial set time of the proposed backfill. Under no circumstance shall placement continue at an injection point longer than that period on time for the mix to take initial set. A stage of lift cannot be installed on another lift until a proper set has been obtained.
- G. Methods for preventing damage to pipe joints due to thermal expansion of the pipe during backfill grouting shall be acceptable to the Engineer. The Contractor is responsible for the repair of any pipe damage caused by thermal expansion during grouting.
- H. Contractor shall limit pressure on the annular space to prevent damage or distortion to the carrier pipe or casing pipe.
- I. The pipe shall be solidly supported from the casing pipe in four quadrants (bottom, top and sides) using casing spacers secured sufficiently to prevent pipe movement during grouting or pressure testing. Bracing shall be located within 2 feet of each pipe joint and not farther than 20 feet apart. Adjust the elevation and alignment of each pipe with wood shims if necessary before blocking. Pipe alignment tolerance shall be as specified for general pipe installation. Contractor shall not remove bracing and supports for carrier pipe until backfill has achieved initial set as determined by ASTM C403.
- J. The pipe in the pits shall be solidly supported from the pit wall using bracing capable of supporting the weight of the pipe and secured sufficiently to prevent pipe movement during grouting or pressure testing. Pipe joints shall be adequately restrained to resist pipe pullout. Pipe alignment tolerance shall be as specified for general pipe installation. Contractor shall not remove bracing and supports for carrier pipe until backfill has achieved initial set as determined by ASTM C403.
- K. Volume of backfill injected shall be calculated on an indirect basis and compared with the anticipated volume per foot of pipe backfilled.

### 3.06 RESTORATION

- A. All areas disturbed by construction shall be restored to existing or better condition and maintained until accepted by the Engineer, the City of Chattanooga, and Norfolk Southern Corporation.

END OF SECTION

## PART 1 GENERAL

### 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install precast concrete manholes, structures, frames and covers, access hatches, manhole rungs, ladders and appurtenances all as shown on the Drawings and as specified herein.

### 1.02 RELATED WORK

- A. Excavation and backfill is included in Section 31 23 00.
- B. Cast-in-place concrete is included in Section 03 30 00.

### 1.03 SUBMITTALS

- A. Submit, in accordance with Section 01 33 23, shop drawings showing details of construction, reinforcing, joints, pipe connection to manhole, manhole rungs, manhole platforms (if applicable), manhole frames and covers, access hatches, and ladders.
- B. Submit for review, structural calculations and drawings for all precast structures.
- C. Concrete design mix data and concrete test cylinder reports from an approved concrete testing laboratory certifying that the concrete used in the precast structures conforms with the strength requirements specified herein.

### 1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM A48 - Standard Specification for Gray Iron Castings
  - 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 3. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
  - 4. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
  - 5. ASTM C150 - Standard Specification for Portland Cement.
  - 6. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
  - 7. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

8. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
  9. ASTM D4101 - Standard Specification for Polypropylene Plastic Injection and Extrusion Materials.
- B. American Concrete Institute (ACI)
1. ACI 318 - Building Code Requirement for Structural Concrete.
- C. American Association of State Highway and Transportation Officials (AASHTO)
- D. Occupational Safety and Health Administration (OSHA)
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 QUALITY ASSURANCE

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the Owner. Such inspection may be made at the place of manufacture, or on the work after delivery, or at both places and the materials shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein; even though samples may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All materials which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.
- B. At the time of inspection, the materials will be carefully examined for compliance with the ASTM standard specified below and this Section and with the approved manufacturer's drawings. All manhole sections shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.
- C. Imperfections in manhole sections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at 7 days and 5,000 psi at 28 days, when tested in 3-in by 6-in cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.



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## PART 2 PRODUCTS

### 2.01 PRECAST CONCRETE MANHOLE SECTIONS

- A. Precast concrete barrel sections and transition top sections, shall conform to ASTM C478 and meet the following requirements:
1. The wall thickness shall not be less than 5-in for 48-in diameter reinforced barrel sections, 6-in for 60-in diameter reinforced barrel sections and 7-in for 72-in diameter reinforced barrel sections.
  2. Top sections shall be eccentric except that barrel sections shall be used where shallow pipe cover requires a top section less than 4-ft as shown on the Drawings.
  3. Barrel sections shall have tongue and groove joints.
  4. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 3,000 psi and not before 5 days after fabrication and/or repair, whichever is longer.
  5. Precast concrete barrel sections with precast top slabs and precast concrete transition sections shall be designed for a minimum of H-20 loading plus the weight of the soil above at 120 pcf.
  6. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each precast section.
  7. Precast concrete bases shall be constructed and installed as shown on the Drawings. The thickness of the bottom slab of the precast bases shall not be less than the manhole barrel sections or top slab whichever is greater.
  8. Knock out panels shall be provided in precast manhole sections at the locations shown on the Drawings. They shall be integrally cast with the section, 2-1/2-in thick and shall be sized as shown on the Drawings. There shall be no steel reinforcing in knock out panels.

### 2.02 PRECAST CONCRETE STRUCTURES

- A. The precast reinforced concrete structures shall be manufactured by Rotundo & Sons, Inc.; American Precast or equal. The inside dimensions, headroom requirements and minimum thickness of concrete shall be as indicated on the Drawings. The manufacturer shall notify the Engineer at least 5 working days prior to placing concrete during the manufacturing process. The Engineer may inspect the reinforcing steel placement and/or require the manufacturer to provide photographs of each section showing the location of all reinforcing steel prior to the placing of concrete. Should it be found that the placement of steel is not as detailed in the shop drawing submittals, the section in question shall be rejected and a replacement section shall be manufactured at the Contractor's expense. Failure to properly notify the Engineer prior to placing concrete shall require the precast sections to be rejected and replacement sections to be manufactured at the Contractor's expense.

- B. Structural design calculations and Drawings shall be prepared and stamped by a professional engineer registered in the State of Tennessee.
- C. All precast concrete shall have a minimum compressive strength of 5,000 psi at 28 days. Water shall be kept to a minimum to obtain concrete which is as dense and watertight as possible. The maximum water-to-cement ratio shall be 0.40 by weight and the minimum cement content shall be 600 lbs. of cement per cubic yard of concrete. The above ratios shall be revised for sacks of cement weighing different from 94 pounds per sack.
- D. Design Criteria
1. All precast concrete members shall conform to ACI 318.
  2. When the design yield strength "fy" for tension reinforcement exceeds 40,000 psi, the "z" values referred to in ACI 318 shall not exceed 95 kips/in. The flexural stress in reinforcement under service loads "fs" shall be calculated and shall not be greater than 50 percent of the specified yield strength fy.
  3. The precast concrete structure's elements shall be designed to support their own weight, the weight of soil above at 120 pcf and shall be capable of withstanding a live load equal to an AASHTO HS-20 highway loading applied to the top slab.
  4. The base slab and walls shall be cast together to form a monolithic base section.
  5. All exterior walls shall be designed for an equivalent fluid pressure of 90 lbs. /sq. ft. The top of the pressure diagram shall be assumed to originate at finished ground level. Additional lateral pressure from approaching truck wheels shall be considered in accordance with AASHTO.
  6. The structural design shall take into account discontinuities in the structure produced by openings and joints in the structure.
  7. The structures shall be designed to prevent flotation without the benefit of skin friction when the ground water level is at finished ground surface. Flotation forces shall be resisted by the dead load of the structure and soil directly above the structure. Weight of equipment and piping within the structure and soil frictional forces shall not be considered as being effective in resisting flotation forces.
  8. If the design of the box structure requires a concrete pad to prevent flotation, the cost of designing, furnishing and installing a reinforced concrete pad shall be included in the price for the structure. Details of the design of the concrete pad (if required) shall be submitted to the Engineer for review.
  9. All walls and slabs shall be analyzed by accepted engineering principles. Openings shall be completely framed as required to carry the full design loads to support walls. All slabs and walls shall be fully reinforced on both faces and the minimum reinforcing shall be No. 5 at 12-in E.F.E.W. Additional reinforcing shall be provided around all openings.
  10. The horizontal wall joints shall not be located within 18-in of the horizontal centerline of wall penetrations.

- E. The structure shall be built by the manufacturer in no more than four major sections including the top slab if required.
- F. Where top slabs are used or required, lifting hooks shall be provided.
- G. As required, access openings and pipe penetrations shall be formed openings and located as shown on the Drawings.
- H. Wall sleeves as shown on the Drawings, shall be provided to the precast concrete manufacturer for inclusion in the manufacture of the structure.

## 2.03 BRICK MASONRY

- A. The bricks shall be good, sound, hard and uniformly burned, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Underburned or salmon brick will not be acceptable and only whole brick shall be used unless otherwise permitted. In case bricks are rejected by the Engineer, they shall be immediately removed from the site of the work and satisfactory bricks substituted therefor.
  - 1. Bricks for the channels and shelves shall comply with ASTM C32 for Sewer Brick, Grade SS (from clay or shale) except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.
  - 2. Bricks for building up and leveling manhole frames shall conform to ASTM C62.
- B. Mortar used in the brickwork shall be composed of 1 part Type II Portland Cement conforming to ASTM C150 to 2 parts sand to which a small amount of hydrated lime not to exceed 10 lbs. to each bag of cement shall be added.
- C. The sand used shall be washed, cleaned, screened, sharp and well graded as to different sizes and with no grain larger than will pass a No. 4 sieve. It shall be free from vegetable matter, loam, organic or other materials of such nature or of such quantity as to render it unsatisfactory.
- D. The hydrated lime shall also conform to ASTM C207.

## 2.04 MANHOLE FRAME AND COVER

- A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.
- B. Manhole covers shall have a diamond pattern, pickholes and the words SANITRAY SEWER, WATER, ELECTRIC, etc., as appropriate, cast in 3-in letters. Manhole frame and covers shall be LeBaron Foundry; Mechanics Iron Foundry; Neenah Foundry or equal.

## 2.05 JOINTING PRECAST MANHOLE SECTIONS AND STRUCTURES

- A. Tongue and groove joints of precast manhole and structure sections shall be sealed with either a round rubber O-ring gasket or a preformed flexible joint sealant. The O-ring shall conform to ASTM C443. The preformed flexible joint sealant shall be Kent Seal No. 2 by Hamilton-Kent; Ram-Nek by Henry Company, El Segundo, CA or equal.
- B. Joints shall be designed and manufactured so that the completed joint will withstand an internal water pressure of 15 psi without leakage or displacement of the gasket or sealant.

## 2.07 PIPE CONNECTIONS

- A. Pipe connections may be accomplished in the following ways:
  - 1. A tapered hole filled with non-shrink waterproof grout, Hallemite; Waterplug; Embecco or equal, after the pipe is inserted is acceptable, providing the grout is placed carefully to completely fill around the pipe. If this method is used, place concrete encasement to assure a total 12-in of concrete including manhole thickness around the pipe stub.
  - 2. The "Lock Joint Flexible Manhole Sleeve" shall be cast in the precast manhole base. The stainless steel strap shall be protected from corrosion with a bituminous coat.
  - 3. "A-Lok" shall be a rubber like gasket cast in the precast manhole base. The rubber gasket shall be cast into a formed opening in the manhole.
  - 4. "KOR-N-SEAL" joint shall be installed as recommended by the manufacturer. The stainless steel clamp shall be protected from corrosion with a bituminous coat.

## 2.08 DAMPPROOFING

- A. Brushed dampproofing shall be an asphalt emulsion reinforced with fibers conforming to ASTM D1227, Type II, Class 1. The dampproofing shall be Hydrocide 700B by Sonneborn Building Products, Division of BASF; Karnak 220 Asphalt Emulsion by Karnak Corporation, Clark, NJ or equal.

# PART 3 EXECUTION

## 3.01 INSTALLATION

- A. Manhole and Structure Installation
  - 1. Manhole and structure shall be constructed to the dimensions shown on the Drawings and as specified herein. All work shall be protected against flooding and flotation.
  - 2. The bases of manholes shall be placed on a bed of 12-in screened gravel as shown on the Drawings. The bases shall be set at a grade to assure that a maximum of 8-in thickness of brickwork will bring the manhole frame and cover to final grade.

Cast-in-place bases shall be constructed in accordance with the requirements of Division 3 and the details shown on the Drawings.

3. Precast concrete barrel sections and structures shall be set plumb and with sections in true alignment with a 1/4-in maximum tolerance to be allowed. The joints of precast barrel sections shall be sealed with either a rubber O-ring set in a recess or the preformed flexible joint sealant used in sufficient quantity to fill 75 percent of the joint cavity. The outside and inside joint shall be filled with non-shrink mortar and finished flush with the adjoining surfaces. Allow joints to set for 24-hours before backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. If any leaks appear in the manholes, the inside joints shall be caulked with lead wool to the satisfaction of the Engineer. Install the precast sections in a manner that will result in a watertight joint.
4. Holes in the concrete barrel sections required for handling or other purposes shall be plugged with a non-shrinking grout or non-shrinking grout in combination with concrete plugs and finished flush on the inside.
5. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting manhole sections in place to prevent any subsequent jarring which may loosen the mortar joints.

#### B. Manhole Pipe Connections

1. Manhole pipe connections shall be accomplished in the ways specified herein. Pipe stubs for future extensions shall also be connected and the stub end closed by a suitable watertight plug.

#### C. Brickwork

1. Mortar shall be mixed only in such quantity as may be required for immediate use and shall be used before the initial set has taken place. Mortar shall not be retained for more than 1-1/2 hours and shall be constantly worked over with hoe or shovel until used. Anti-freeze mixtures will not be allowed in the mortar. No masonry shall be laid when the outside temperature is below 40 degrees F unless provisions are made to protect the mortar, bricks and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. The Engineer's decision as to the adequacy of protection against freezing shall be final.
2. Channels and shelves shall be constructed of brick and concrete as shown on the Drawings. The brick lined channels shall correspond in shape with the lower half of the pipe. The top of the shelf shall be set at the elevation of the crown of the highest pipe and shall be sloped 1-in per foot to drain toward the flow through channel. Brick surfaces exposed to sewage flow shall be constructed with the nominal 2-in by 8-in face exposed (i.e. bricks on edge).
3. Manhole covers and frames shall be set in a full mortar bed and bricks, a maximum of 8-in thick, shall be utilized to assure frame and cover are set to the existing grade. If full width paving is the permanent paving, the manhole frame and cover shall be reset to final grade prior to placement of permanent paving.

#### D. Dampproofing

1. Outer surfaces of precast and cast-in-place manholes [and structures] shall dampproofed at the rate of 30 to 35 sq. ft. per gallon as directed by the Engineer and in accordance with manufacturer's instructions.

### 3.02 LEAKAGE TESTS

- A. Leakage tests shall be made and observed by the Engineer on each manhole. The test shall be the exfiltration test made as described below:
- B. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6-ft of the ground surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing the horizontal joints below the 6-ft depth line. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.
- C. The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day shall be the cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.
- D. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc., i.e. it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.
- E. If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Engineer, such a test can be used to evaluate the water- tightness of the manhole. However, if the Engineer is not satisfied, lower the water table and carry out the test as described hereinbefore.

F. Leakage Tests for Structures

1. The Engineer will visually inspect structure(s) for possible leaks before backfilling of structures is allowed. All joints shall be sealed to the satisfaction of the Engineer.
2. The Engineer may require an exfiltration test as described for manholes on any structure for which he/she deems the test appropriate.

### 3.03 CLEANING

- A. All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

END OF SECTION