

CONTRACT DOCUMENTS

TECHNICAL SPECIFICATIONS

FOR

MCCORMICK COUNTY -

CULVERT REPLACEMENT

AND REHABILITATION

PREPARED FOR:



J – 30856.0003

10/23/2023

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Storm Drainage

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02720

02722

INVITATION TO BID

Legal Notice

- 1. Sealed proposals for McCormick County Culvert Replacement and Rehabilitation owned by McCormick County will be received by Julian Mears at the Multi-Purpose Room in the McCormick County Administration Building, 610 South Mine Street, McCormick, SC 29835 until 10 AM on November 27, 2023 at which time they will be publicly opened.
- 2. The project consists of the following generally described work: Structural repairs to two culverts under Elam Drive in McCormick County, South Carolina. Rehabilitation of the culverts includes the installation of a Snap-Tite liner on three (3) 48-inch Corrugated Metal Pipes (CMP), complete removal and replacement of one (1) undersized 18-inch CMP with a 24-inch Reinforced Concrete Pipe (RCP), installation of headwalls at the ends of both culverts. Project also includes a maintenance repair on a culvert under Little River Drive involving the installation of a Snap-Tite liner on one (1) 18-inch CMP.
- 3. Plans and Specifications are open to inspection at 610 South Mine Street, McCormick, SC 29835, or may be obtained from Thomas & Hutton Engineering Co., 1501 Main Street, Suite 400, Columbia, SC 29201. Hard Copies of the plans and specifications be obtained upon payment of \$250.00 (plus shipping charges as applicable). Electronic copies of the plans and specifications can be obtained on request. Any payments are <u>non-refundable</u>. Contact Allison Busch, at Thomas & Hutton, by emailing <u>busch.a@tandh.com</u> or calling at (803) 451-6784.
- 4. Bids shall be accompanied by a bid bond or certified cashier's check in an amount not less than 10% of the base bid. All bonds shall be by a surety company licensed in South Carolina with an "A" minimum rating of performance and a financial strength of at least five times the contract price as listed in the most current publication of "Best's Key Rating Guide Property Liability." Performance and Payment Bonds, each in an amount equal to 100% of the contract price shall be required of the successful bidder if contract is awarded. Each Bond shall be accompanied by a "Power of Attorney" authorizing the attorney-in-fact to bind the surety and certified to include the date of the bond.
- 5. Owner reserves the right to reject any or all Bids, including without limitation, the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes it would not be in the best interest of the Project to make an award to Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Owner.
- 6. A Pre-Bid Conference will be held at 10 AM on November 8, 2023 in the Multi-Purpose Room at the McCormick County Administration Building, 610 South Mine Street, McCormick, SC 29835. All prospective bidders are encouraged to attend. Failure to attend could be cause for rejection of the bid.

McCormick County

END OF INVITATION TO BID

INSTRUCTIONS TO BIDDERS

- **INTENTION:** It is intended the Instructions to Bidders, General Conditions, Supplementary Conditions, Technical Specifications and Construction Drawings shall cover the complete work to which they relate.
- ARTICLE 1 DEFINED TERMS: In addition to the terms defined in the General Conditions, (EJCDC C-700)(2007), additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof.
 - 1.1. **Bidder** One who submits a Bid directly to Owner as distinct from a subbidder, who submits a bid to a Bidder.
 - 1.2. **Successful Bidder** The lowest, responsible, and responsive Bidder to whom Owner (based on Owner's evaluation as hereinafter provided) makes an award.
 - 1.3. **Bid** A complete and properly signed offer to execute work for the prices stipulated in Bid Form and submitted in accordance with the Bidding Documents.
 - 1.4. **Addenda** Graphic or written documents issued by Engineer prior to the opening of Bids issued to clarify, revise, add to, or delete information in the original bidding documents or in previous addenda.
- ARTICLE 2 BID FORM: All Bids must be made upon the Bid Forms hereto annexed and shall state the amount bid for each item shown, and all bids must be for materials and work called for in the specifications. Deposits for plans and specifications are not refundable.
 - 2.1 The Bid Form is included with the Bidding Documents; additional copies may be obtained from Engineer.
 - 2.2 All blanks on the Bid Form must be completed by printing in black ink or by typewriter.
 - 2.3 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.
 - 2.4 All names must be typed or printed in black ink below the signature.
 - 2.5 The Bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form.)

2.6 The address and telephone number for communications regarding the Bid must be shown.

ARTICLE 3 QUALIFICATIONS OF BIDDERS:

- 3.1 To demonstrate qualifications to perform the Work, each Bidder must be prepared to submit within five days after Bid opening upon Owner's request detailed written evidence such as financial data, previous experience, present commitments, and other such data as may be necessary to assist Owner in determining Contractor's qualifications.
- 3.2 Each Bid must contain evidence of Contractor's authority to conduct business in the state where the Work is to be performed. State Contractor license number, if applicable, must also be shown on the Bid Form.

ARTICLE 4 COPIES OF BIDDING DOCUMENTS:

- 4.1 Complete sets of Bidding Documents must 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.
- 4.2 Owner and Engineer in making copies of Bidding Documents available for a non-refundable deposit do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 5 EXAMINATION OF BIDDING DOCUMENTS, OTHER DATA, AND SITE:

- 5.1 It is the responsibility of each Bidder before submitting a bid:
 - 5.1.1 To examine and study thoroughly the Bidding Documents and other related data identified in the Bidding Documents;
 - 5.1.2 To visit the work site to ascertain by inspection pertinent local conditions such as location, character and accessibility of the site including existing surface and subsurface conditions in the work area; availability of facilities, location and character of existing work within or adjacent thereto, labor conditions, etc.
 - 5.1.3 To become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
 - 5.1.4 To obtain and carefully study (or assume responsibility for doing so) all addition or supplementary examination investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, an Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance or the Work or which relate any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly

required of the bidding documents, and safety precautions and programs incident thereto;

- 5.1.5 To study and carefully correlate Bidder's knowledge and observations with the Bidding Documents and such other related data; and
- 5.1.6 To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the Bidding Documents and such other related documents;
- 5.1.7 to 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 bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;
- 5.1.8 To 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;
- 5.1.9 To determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.
- 5.2 The Owner shall make available to all prospective bidders, previous to receipt of bids, information that it may have as to sub-soil conditions and surface topography at the work site. Such information shall be given as the best factual information available without being considered as a representation of the Owner.
- 5.3 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 5, 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 6 PRE-BID CONFERENCE: A Pre-Bid conference will be held at 10 AM on November 8, 2023 in the Multi-Purpose Room at the McCormick County Administration Building, 610 South Mine Street, McCormick, SC 29835. Representatives of OWNER and ENGINEER will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 INTERPRETATIONS AND ADDENDA:

- 7.1 All questions about the meaning or intent of the Bidding Documents are to be directed to Engineer. The person submitting the request shall do so in writing and be responsible for its prompt delivery. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
- 7.2 Addenda may also be issued to modify the Bidding Documents as deemed advisable by Owner or Engineer.

ARTICLE 8 BID SECURITY:

- 8.1 Each Bid must be accompanied by Bid security made payable to Owner in an amount of ten percent of Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond (on form attached, if a form is prescribed) issued by a surety company licensed in **South Carolina** with an "A" minimum rating of performance and a financial strength of at least five times the contract price as listed in the most current publication of "Best's Key Rating Guide Property Liability."
- 8.2 The Bid security of Successful Bidder will be retained until such Bidder has executed the Agreement, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Agreement and furnish the required contract security within fifteen days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of the seventh day after the Effective Date of the Agreement or the sixty-first day after the Bid opening, whereupon Bid security furnished by such bidders will be returned. Bid security with Bids that are not competitive will be returned within seven days after the Bid opening.
- ARTICLE 9 CONTRACT COMPLETION TIME: The number of days within which, or by which the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement. Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 10 SUBSTITUTE AND "OR-EQUAL" ITEMS:

10.1 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of

material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in the General Conditions and may be supplemented in the General Requirements.

ARTICLE 11 SUBCONTRACTORS, SUPPLIERS, AND OTHERS:

- 11.1 Each bid must be accompanied by a list of 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 OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER or ENGINEER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.
- 11.2 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contact to the next lowest Bidder proposing 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.
- 11.3 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.
- ARTICLE 12 SUBMITTAL OF BIDS: Bids shall be submitted at the time and place indicated in the Invitation to Bid and shall be enclosed in a sealed opaque envelope, marked with the project title, and name and address of Bidder, and accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it. Contractor license number(s) shall be written on the face of the bid envelope.

Each Bidder is responsible for seeing their Bid is received by the Owner not later than the advertised time set for the opening of Bids.

ARTICLE 13 MODIFICATION AND WITHDRAWAL OF BIDS:

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

- 13.2 If, within twenty-four 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 there was a material and substantial mistake in the preparation of its Bid, Bidder may withdraw its Bid and the Bid security will be returned. Thereafter, Bidder will be disgualified from further bidding on the Work to be provided.
- ARTICLE 14 OPENING OF BIDS: Bids will be opened and (unless obviously non-responsive) read aloud publicly at the place where Bids are to be submitted. An abstract of the amount of the base Bids and major alternates (if any) will be made available to Bidders after the opening of Bids.
- ARTICLE 15 ACCEPTANCE OF BIDS: Bids may not be withdrawn (except as noted in Paragraph 13) after the time set for the opening of Bids. Bids will remain subject to acceptance for 60 days after the day of the Bid opening, but the Owner may, in its sole discretion, release any Bid and return the Bid security prior to expiration of the acceptance period.

ARTICLE 16 AWARD OF CONTRACT:

- 16.1 Owner reserves the right to reject any or all Bids, including without limitation, the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes it would not be in the best interest of the Project to make an award to a Bidder, whether because the Bid is not responsive, or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Owner.
- 16.2 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. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.
- 16.3 In evaluating Bids, Owner will consider the qualification of Bidders, 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.

The Owner will also consider whether the Bidder involved:

- a) Maintains a permanent place of business;
- b) Has adequate plant and equipment to do the work properly and expeditiously;
- c) Has suitable financial status to meet obligations incidental to the work;
- d) Has appropriate technical experience.

- 16.4. Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. Owner also may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.
- 16.5. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- 16.6. If the contract is to be awarded, it will be awarded to the Bidder whose evaluation by Owner indicates the award will be in the best interest of the Project.
- 16.7. If the contract is to be awarded, Owner will give Successful Bidder a Notice of Award within 60 days after the day of the Bid opening.
- ARTICLE 17 MODIFICATIONS OF QUANTITIES: If the lowest bona fide Bid exceeds the money available for the Work, the Owner reserves the right to delete enough of the Work to bring the cost within the available funds. The Owner also reserves the right to delete whichever items or portions of items considered to be in the best interest of the Owner.
- ARTICLE 18 CONTRACT SECURITY: The General Conditions and Supplementary Conditions set forth Owner's requirements as to performance and payment bonds. When the Successful Bidder delivers the executed Agreement to the Owner, it must be accompanied by the required performance and payment bonds.
- **ARTICLE 19 SIGNING THE AGREEMENT:** When the Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within 15 days thereafter, Contractor shall sign and deliver the required counterparts of the Agreement and attached documents to Owner with the required Bonds. Within 10 days thereafter, Owner shall deliver one fully signed counterpart to Contractor.
- **ARTICLE 20 LAWS AND REGULATIONS:** The Contractor shall comply with local, District, County, State, and Federal laws applicable to the work.

The Contractor shall comply with the Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act of 1970 as amended through January 1, 2004 (PL 91-596) and under Section 107 of the Contract Work and Safety Standards Act (PL) 91-54). The regulations are administered by the Department of Labor and the Contractor shall allow access to the project to personnel from this Department.

- ARTICLE 21 CONTRACTOR'S AND SUBCONTRACTOR'S INSURANCE: Contractor shall not commence work under this contract until obtaining all the insurance required by the Supplementary Conditions.
- ARTICLE 22 TERMINATION OF CONTRACT: If the Owner is made to stop construction of the work because of an order from a Court or State Department, the contract shall be terminated. Payment will be made for work completed and a proration of the work underway, materials stored, and for the overhead and profit of the completed work and work underway. Payment will not be made for anticipated profit and overhead on work not completed or underway.

BID FORM

PROJECT IDENTIFICATION: McCormick Culverts – Replacement and Rehabilitation

CONTRACT IDENTIFICATION AND NUMBER: 30856.0003

THIS BID IS SUBMITTED TO: McCormick County

- 1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
- 2. BIDDER accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the day of Bid opening, or for such longer period of time BIDDER may agree to in writing upon request of OWNER.
- 3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:
 - a. BIDDER has examined and carefully studied the Plans and Specifications for the work and contractual documents relative thereto, and has read all Technical Provisions, Supplementary Conditions, and General Conditions, furnished prior to the opening of Bids and can fulfill the requirements of the work to be performed.
 - b. BIDDER further acknowledges hereby receipt of the following Addenda:

ADDENDUM NO.	DATE

- c. BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions possibly affecting cost, progress, performance and furnishing of the Work;
- d. BIDDER is familiar with and is satisfied as to all federal, state, and local Laws and Regulations possibly affecting cost, progress, performance and furnishing of the Work.

- e. BIDDER has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structure at or contiguous to the site (except underground Facilities) have been identified in the Supplementary Conditions. BIDDER acknowledges such reports and drawings are not Contract Documents and may not be complete for BIDDER's purposes. BIDDFR acknowledges OWNER and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bidding Documents with respect to Underground Facilities at or contiguous to the site. BIDDER has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost progress, performance or furnishing of the work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto. BIDDER does not consider any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price and other terms and conditions of the Bidding Documents.
- f. BIDDER is aware of the general nature of Work to be performed by Owner and others at the site relating to Work for which this Bid is submitted as indicated in the Bidding Documents.
- g. BIDDER has correlated the information known to BIDDER, information and observations obtained from visits to the site, reports and drawings identified in the Bidding Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
- h. BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies BIDDER has discovered in the Bidding Documents and the written resolution thereof by ENGINEER is acceptable to BIDDER. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.
- i. This bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.
- 4. BIDDER will complete the Work in accordance with the Contract Documents for the following price(s):

Item	Quantity	Unit	ltem	Unit Price	Total
1	1	LS	MOBILIZATION		
2	1	LS	TRAFFIC CONTROL		
3	1	LS	CLEARING & GRUBBING		
4	80	CY	EARTHWORK (CUT/FILL)		
5	45	СҮ	FLOWABLE FILL		
6	10.4	TON	8" STABILIZED AGGREGATE BASE COURSE		
7	2.6	TON	2" ASPHALTIC CONCRETE SURFACE COURSE		
8	2.6	TON	2" HOT MIX ASPHALT SURFACE COURSE		
9	0.2	TON	LIQUID ASPHALTIC BINDER		
10	50	LF	24" REINFORCED CONCRETE PIPE		
11	144	LF	42" SNAP-TITE PIPE LINER (INCLUDES GROUT)		
12	33	LF	14" SNAP-TITE PIPE LINER (INCLUDES GROUT)		
13	2	EA	CONCRETE HEADWALL (TRIPLE BARREL 48" PIPES)		
14	2	EA	CONCRETE HEADWALL (SINGLE BARREL 24" PIPE)		
Erosion Control Measures:					
15	45	SY	ΒΙΡ-ΒΑΡ ΓΙ ΑSS Α		
10			GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP		
16	45	SY	(CLASS 2) TYPE A		
17	2	EA	ROCK DITCH CHECK		
18	25	LF	SILT FENCE		
	PROJECT TOTAL COST				

TOTAL BID FOR ALL ESTIMATED PRICES			
	(Use words)		
	(\$)
	(1	(Figures)	-/

Unit Prices have been computed in accordance with paragraph 11.03.C of the General Conditions.

BIDDER acknowledges 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, determined as provided in the Contract Documents.

- 5. BIDDER agrees the Work will be substantially complete within 60 calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03 of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 75 calendar days after the date when the Contract Times commence to run.
- 6. BIDDER accepts provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within times specified in the Agreement.
- 7. The following documents are attached to and made a condition of this Bid:
 - a. Required Bid Security in the form of <u>10 percent of the Bid Total Price</u>.
 - b. Required BIDDER's Qualification Statement with supporting data.
- 8. The undersigned further agrees in case of failure on his/her part to execute the said contract and the Bond within 15 consecutive calendar days after written notice being given of the award of the contract, the check or bid bond accompanying this bid, and the monies payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure, otherwise, the check or bid bond accompanying this proposal shall be returned to the undersigned.
- 9. Communications concerning this Bid shall be addressed to:

Thomas & Hutton Allison Busch, P.E. 1501 Main Street, Suite 400 803.451.6784 busch.a@tandh.com

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

SUBMITTED on	, 20
	CONTRACTOR'S NAME
ADDRESS:	
	BY:
State Utility Contractor License No.	SC

BID BOND

BIDDER (Name and Address):	
SURETY (Name and Address of Principal Place of	of Business):
OWNER (Name and Address):	
BID	
BID DUE DATE:	
PROJECT (Brief Description Including Location):	
BOND	
BOND NUMBER:	DATE:
PENALSIIM	(Not later than Bid Due Date)
	(10% of Bid Sum)
IN WITNESS WHEREOF, Surety and Bidder, intend the reverse side hereof, do each cause this Bid agent, or representative.	ding to be legally bound hereby, subject to the terms printed on Bond to be duly executed on its behalf by its authorized officer,
BIDDER	SURETY
(Seal)	(Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
Bv:	Bv:
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest:	Attest:
Signature and Title	Signature and Title
Note: (1) Above addresses are to be used for (2) Any singular reference to Bidder, Sur	giving required notice. rety, Owner, or other party shall be considered plural where applicable.

PENAL SUM FORM

- 1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond.
- 2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Documents.
- 3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Document, or
 - 3.2 All bids are rejected by Owner, or
 - 3.30wner 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 and any and all defenses based on arising out of any time extension to issue notice of award agreed to in writing by Owner and Bidder, provided that the time for issuing notice of award including extensions shall not in the aggregate exceed 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. Notice required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
- 9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.
- 10. This Bond is intended to conform to all applicable statutory requirements. Any applicable 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 the Bond conflicts with any applicable provision of any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
- 11. The term "bid" as used herein includes a bid, offer or proposal as applicable.

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

THIS AGREEMENT is dated as of the _____ day of ______ in the year 20___ by and between McCormick County (hereinafter called OWNER) and ______ (hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 WORK

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

Structural repairs to two culverts under Elam Drive in McCormick County, South Carolina. Rehabilitation of the culverts includes the installation of a Snap-Tite liner on three (3) 48-inch Corrugated Metal Pipes (CMP), complete removal and replacement of one (1) undersized 18-inch CMP with a 24-inch Reinforced Concrete Pipe (RCP), installation of headwalls at the ends of both culverts. Project also includes a maintenance repair on a culvert under Little River Drive involving the installation of a Snap-Tite liner on one (1) 18-inch CMP.

ARTICLE 2 ENGINEER

The Project has been designed by Thomas & Hutton Engineering Co. who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 3 CONTRACT TIMES

All time limits for Substantial Completion and completion and readiness for final payment as stated in the Contract Documents are of essence to the Contract.

- 3.1 The Work will be substantially completed within 60 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 75 days after the date when the Contract Times commence to run. Included in the contract times are 10 days for rain delay. Time delays due to rain in excess of the above days shall be reported by the Contractor to the Engineer in writing, within 30 days of each event.
- 3.2 Liquidated Damages. OWNER and CONTRACTOR recognize time is of the essence for this Agreement and OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving the actual loss suffered by OWNER if the Work is not substantially complete on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree to liquidated damages for delay (but not as a penalty) the CONTRACTOR shall pay OWNER dollars (\$) for each day expiring after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial completion, if CONTRACTOR shall neglect, refuse or fail to complete the remaining Work within the time specified in paragraph 3.1 for completion and readiness for final payment or any proper extension thereof granted by OWNER, CONTRACTOR, shall pay OWNER dollars (\$) for each day expiring after the time specified in paragraph 3.1 for completion and readiness for final payment.

ARTICLE 4 CONTRACT PRICE

4.1 UNIT PRICE WORK

OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds of the amounts determined for all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of item as indicated in the CONTRACTOR'S UNIT PRICE BID (attached hereto as an exhibit), said amount being:

(dollars), \$

(use words)

(figures)

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

ARTICLE 5 PAYMENT PROCEDURES

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

- 5.1 Progress Payments; Retainage. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, on or about the 25th day of each month during performance of the Work as provided in paragraphs 5.1.1., 5.1.1.2. and 5.2. below. All such payments will be measured by the schedule of values established in paragraph 2.07 of the General Conditions (and in the case of Unit Price Work based on the number of units completed) as provided in the General Requirements.
 - 5.1.1 For Cost of Work: Progress payments on account of the Cost of the Work will be made:
 - 5.1.1.1 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 shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

90% of the Work completed (with the balance being retainage). If Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER, on recommendation of ENGINEER, may determine as long as the character and progress of the Work remain satisfactory to them, there will be no additional retainage on account of Work completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed.

90% of Cost of the Work (with the balance being retainage) applicable to materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in paragraph 14.02.A.1 of the General Conditions).

- 5.1.1.2 Upon Substantial Completion, in an amount sufficient to increase the total payments to CONTRACTOR to **95%** of the Cost of the Work, (with the balance being retainage), less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.
- 5.2 Final Payment. 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 6 INTEREST

All moneys not paid within thirty (30) days of the due date as provided in Article 14 of the General Conditions, shall bear interest at the rate of 6 percent annually or the minimum required by law at the place of the Project, whichever is greater.

ARTICLE 7 CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:

- 7.1 CONTRACTOR has examined and carefully studied the Contract Documents (including the Addenda indicated in Article 8 hereinafter) and the other related data identified in the Bidding Documents.
- 7.2 CONTRACTOR has visited the site and become familiar with and is satisfied as to the general, local and site conditions possibly affecting cost, progress, performance or furnishing of the Work.
- 7.3 CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations possibly affecting cost, progress, performance and furnishing of the Work.
- 7.4 CONTRACTOR has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in the General Conditions. CONTRACTOR acknowledges such reports and drawings are not Contract Documents and may not be complete for CONTRACTOR's purposes. CONTRACTOR acknowledges OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the construction to be employed by CONTRACTOR and safety precautions and programs incident thereto. CONTRACTOR does not consider any additional examinations, investigations, explorations, tests, studies or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.
- 7.5 CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the site relating to the Work as indicated in the Contract Documents.
- 7.6 CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the site, reports and drawings identified in

the Contract Documents and all additional examinations, investigations, explorations, tests, studies and data with the Contract Documents.

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

ARTICLE 8 CONTRACT DOCUMENTS

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

- 8.1 Invitation to Bid (Pages 00021-1 to 00021-1, inclusive)
- 8.2 Instructions to Bidders (pages 00110-1 to 00110-8, inclusive)
- 8.3 Bid Form (pages 00313-1 to 00313-6, inclusive)
- 8.4 Bid Bond (pages 00411-1 to 00411-2, inclusive)
- 8.5 Standard Form of Agreement Between Owner and Contractor (pages 00506-1 to 00506-8, inclusive)
- 8.6 Performance Bond (pages 00611-1 to 00611-6. Inclusive)
- 8.7 Payment Bond (pages 00621-1 to 00621-6, inclusive)
- 8.8 Notice of Award (pages 00631-1 to 00631-3, inclusive)
- 8.9 Notice to Proceed (pages 00641-1 to 00641-2, inclusive)
- 8.10 General Conditions (pages 1 to 62, inclusive)
- 8.11 Summary of Work (pages 01011-1 to 01011-3, inclusive)
- 8.12 Measurement and Payment (pages 01025-1 to 01025-2, inclusive)
- 8.13 Submittals (pages 01300-1 to 01300-10, inclusive)
- 8.14 Quality Control (pages 01400-1 to 01400-4, inclusive)
- 8.15 Testing Services (pages 01410-1 to 01410-5, inclusive)
- 8.16 Contract Closeout (pages 01702-1 to 01702-2, inclusive)
- 8.17 Operations and Maintenance (pages 01730-1 to 1730-4, inclusive)
- 8.18 Warranties (pages 01740-1 to 01740-2, inclusive)

- 8.19 Bonds (pages 01741-1 to 1741-2, inclusive)
- 8.20 Technical Specifications consisting of 00021-02902 sections, as listed in the Table of Contents.
- 8.21 Drawings consisting of the following sheets with each sheet bearing the following general title:

Sheet	Description	Job No.	P.E. Signature Date
C0	COVER SHEET	30856.0003	
G0.1	GENERAL NOTES AND INDEX	30856.0003	
EX1.1	EXISTING CONDITIONS – ELAM DR	30856.0003	
EX1.2	EXISTING CONDITIONS – LITTLE RIVER DR	30856.0003	
DM1.1	DEMOLITION PLAN – ELAM DR	30856.0003	
EC0.1	EROSION CONTROL NOTES	30856.0003	
EC0.2	EROSION CONTROL NOTES	30856.0003	
EC1.1	EROSION CONTROL PLAN – ELAM DR	30856.0003	
EC1.2	EROSION CONTROL PLAN – LITTLE RIVER DR	30856.0003	
EC4.1	EROSION CONTROL DETAILS	30856.0003	
C1.1	PAVING, GRADING, AND DRAINAGE PLANS – ELAM DR	30856.0003	
C1.2	PAVING, GRADING, AND DRAINAGE PLANS – LITTLE RIVER DR	30856.0003	
C2.1	DRAINAGE PROFILES	30856.0003	
C3.1	PAVING, GRADING, AND DRAINAGE DETAILS	30856.0003	

8.22 Addenda numbers _____ to ____, inclusive.

Exhibits to this Agreement:

- a. CONTRACTOR's Bid (page _____ through page _____ inclusive) marked "Exhibit _____."
- b. Documentation submitted by CONTRACTOR prior to Notice of Award (pages _____ to ____, inclusive).
- c. Any modification, including Change Orders, duly delivered after execution of Agreement.

d. [____]

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

ARTICLE 9 MISCELLANEOUS

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.
- 9.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys becoming due and moneys due, may not be assigned without such consent (except to the extent the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 9.3 OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.
- 9.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision coming as close as possible to expressing the intention of the stricken provision.

ARTICLE 10 OTHER PROVISIONS

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in five counterparts. Two counterparts each have been delivered to OWNER and CONTRACTOR and one counterpart to ENGINEER. All portions of the Contract Documents have been signed, initialed or identified by Owner and Contractor or identified by ENGINEER on their behalf.

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

OWNER	CONTRACTOR
BY (typed)	BY (typed)
BY	BY
ATTEST	ATTEST

Address for giving notices	Address for giving notices
	License No
	Agent for service of process:
CORPORATE SEAL	CORPORATE SEAL

PERFORMANCE BOND

KINO II ALL INLIN DI TITLALI KLALINIA,	,
	(Name & Address of Contractor)
hereinafter called "Principal" and	· · · · · · · · · · · · · · · · · · ·
	(Name & Address of Surety)
	of
State of	, hereinafter called the "Surety" are held and
firmly bound unto	
hereinafter called the "Owner" in th	ne penal sum of

lawful money of the United States of America, to be paid to OWNER, for the payment whereof well and truly to be made we do bind ourselves, our respective executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a certain contract with the Owner dated the ______ day of ______, 20____ for the construction of:

(Name of Contract/Project)

which said contract is incorporated hereby by reference and made a part hereof, and is hereinafter referred to as the Construction Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such, if the Principal shall promptly and faithfully perform and comply with the terms and conditions of said contract; and shall indemnify and save harmless the Owner against and from all costs, expenses, damages, injury or loss to which said Owner may be subjected by reason of any wrongdoing, including patent infringement, misconduct, want of care or skill, default, or failure of performance on the part of said Principal, its agents, subcontractors or employees, in the execution or performance of said Construction Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

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

- 2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except to participate in conferences as provided in Subparagraph 3.1.
- 3. If there is no Owner Default, the Surety's obligations under this Bond shall arise after:
 - 3.1 The Owner has notified the Contractor and the Surety at its address described in Paragraph 10 below, the Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with the Contractor and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Construction Contract. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default; and
 - 3.2 The Owner has declared a Contractor Default and formally terminated the Contractor's right to complete the contract. Such Contractor Default shall not be declared earlier than twenty days after the Contractor and the Surety have received notice as provided in Subparagraph 3.1; and
 - 3.3 The Owner has agreed to pay the Balance of the Contract Price to the Surety in accordance with the terms of the Construction Contract or to a Contractor selected to perform the Construction Contract in accordance with the terms of the contract with the Owner.
- 4. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense, take one of the following actions:
 - 4.1 Arrange for the Contractor, with consent of the Owner, to perform and complete the Construction Contract; or
 - 4.2 Undertake to perform and complete the Construction Contract itself, through its agents or through independent Contractors; or
 - 4.3 Obtain bids or negotiated proposals from qualified Contractors acceptable to the Owner in a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and the Contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 6 in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor's default; or
 - 4.4 Waive its right to perform and complete, arrange for completion, or obtain a new Contractor and with reasonable promptness under the circumstances:

- 4.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, tender payment therefor to the Owner; or
- 4.4.2 Deny liability in whole or in part and notify the Owner citing reasons therefor.
- 5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Subparagraph 4.4, and the Owner refuses the payment tendered or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
- 6. After the Owner has terminated the Contractor's right to complete the Construction Contract, and if the Surety elects to act under Subparagraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract. To the limit of the amount of this Bond, but subject to commitment by the Owner of the Balance of the Contract Price to mitigation of costs and damages on the Construction Contract, 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 resulting from the actions or failure to act of the Surety under Paragraph 4; and
 - 6.3 Liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.
- 7. The Surety shall not be liable to the Owner or others for obligations of the Contractor unrelated to the 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, or successors.
- 8. The Surety hereby waives notice of any changes, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
- 9. 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 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

period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

- 10. Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the signature page.
- 11. 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. The intent is this Bond shall be construed as a statutory bond and not as a common law bond.
- 12. DEFINITIONS:
 - 12.1 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 to the Contractor of 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.
 - 12.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto;
 - 12.3 Contractor Default: Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Construction Contract.
 - 12.4 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.

IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, on this the _____ day of _____, 20___.

CONTRACTOR AS PRINCIPAL:

Principal

(Principal) Secretary

(SEAL)

By:______(Signature & Title)

Address

Witness as to Principal

Address

SURETY:

Surety (Company)

(Surety) Secretary

By:___

Attorney-in-Fact

(SEAL)

Witness as to Surety

Address

<u>Notes:</u>

- 1. Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.
- 2. Bond must be countersigned by a South Carolina resident agent.
- 3. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS,	
	(Name & Address of Contractor)
hereinafter called "Principal" and	
	(Name & Address of Surety)
C	of
State of	, hereinafter called the "Surety" are held and
firmly bound unto	
hereinafter called the "Owner" in the pen	nal sum of
	Dollars (\$)
	(Contract Sum)
lawful money of the United States of Ame well and truly to be made we do bin successors and assigns, jointly and several	erica, to be paid to OWNER, for the payment whereo d ourselves, our respective executors, administrators Ily, firmly by these presents.

WHEREAS, the above bounden Principal has entered into a certain contract with the Owner dated the ______ day of ______, 20____ for the construction of:

(Name of Contract/Project)

which said contract is incorporated hereby by reference and made a part hereof, and is hereinafter referred to as the Construction Contract.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION is such, if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and materials supplied in the prosecution of the work provided for in said Construction Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- 1. The Contractor and the 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. With respect to the Owner, this obligation shall be null and void if the Contractor:

- 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants; and
- 2.2 Defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity whose claim, demand, lien or suit is for payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, provided the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety, and provided there is no Owner Default.
- 3. With respect to Claimants, this obligation shall be null and void if the Contractor promptly makes payment, directly or indirectly, for all sums due.
- 4. The Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with the Contractor have given notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating a claim is being made under this Bond and, with substantial accuracy, the amount of claim.
 - 4.2 Claimants who do not have a direct contract with the Contractor:
 - 4.2.1 Have furnished written notice to the Contractor and sent a copy, or notice thereof, to the Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was performed; and
 - 4.2.2 Have either received a rejection in whole or in part from the Contractor, or not received within 30 days of furnishing the above notice, any communication from the Contractor by which the Contractor has indicated the claim will be paid directly or indirectly; and
 - 4.2.3 Not having been paid within 30 days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the Owner, stating a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the Contractor.
- 5. Compliance shall be considered sufficient if a notice required by paragraph 4 is given by the Owner to the Contractor or to the Surety.
- 6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

- 6.1 Send an answer to the Claimant, with a copy to the Owner, within 45 days after receipt of the claim stating the amounts undisputed and basis for challenging any amounts disputed.
- 6.2 Pay or arrange for payment of any undisputed amounts.
- 7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
- 8. 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 all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and the Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
- 9. The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor unrelated to the Construction Contract. The Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
- 10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
- 11. No suit or action shall be commenced by a Claimant under this bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2.3, 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.
- 12. Notice to the Surety, Owner or Contractor shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by the Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.
- 13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in the 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. The intent is this Bond shall be construed as a statutory bond and not as a common law bond.

- 14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.
- 15. DEFINITIONS:
 - 15.1 Claimant: An individual or entity having a direct contract with the Contractor or with a Subcontractor of the Contractor to furnish labor, material, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment," that part of 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.
 - 15.2 Construction Contract: The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents and changes thereto.
 - 15.3 Owner Default: Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Construction Contract or to perform and complete or comply with the other terms thereof.
IN WITNESS WHEREOF, this instrument is executed in six counterparts, each one of which shall be deemed an original, on this the _____ day of _____, 20___.

CONTRACTOR AS PRINCIPAL:

Principal

(Principal) Secretary

By:____

(Signature & Title)

Address

Witness as to Principal

Address

(SEAL)

SURETY:

Surety (Company)

(Surety) Secretary

By:____

Attorney-in-Fact

(SEAL)

Witness as to Surety

Address

<u>Notes</u>:

- 1. Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute bond.
- 2. Bond must be countersigned by a South Carolina resident agent.
- 3. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

SECTION 00631

NOTICE OF AWARD

	Dated_	
TO:	(Bidder)	
ADDRESS:		
JOB NO.:		
PROJECT:		

CONTRACT

1. FOR: The project consists of the following generally described work: Structural repairs to two culverts under Elam Drive in McCormick County, South Carolina. Rehabilitation of the culverts includes the installation of a Snap-Tite liner on three (3) 48-inch Corrugated Metal Pipes (CMP), complete removal and replacement of one (1) undersized 18-inch CMP with a 24-inch Reinforced Concrete Pipe (RCP), installation of headwalls at the ends of both culverts. Project also includes a maintenance repair on a culvert under Little River Drive involving the installation of a Snap-Tite liner on one (1) 18-inch CMP.

You are notified your Bid dated ______, 20____, for the above Contract has been considered. You are the apparent successful bidder and have been awarded a contract for:

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

The Contract Price of your contract is _____

_____ Dollars (\$______).

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

You must comply with the following conditions precedent within 15 days of this Notice of Award, which is by ______, 20____.

- 1. You must deliver to the OWNER _____ fully executed counterparts of the Agreement including all the Contract Documents. Each of the Contract Documents must bear your signature on the page (pages _____.)
- 2. You must deliver with the executed Agreement the Contract Security (Bonds) as specified in the Instructions to Bidders (Article 8), General Conditions (paragraph 5.01) and Supplementary Conditions.
- 3. (List other conditions precedent)

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

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

OWNE	ĒR
Ву:	
(Title)	
ACCE	PTANCE OF AWARD
(Cont	ractor)
Ву:	(Authorized Signature)
	(Title)

Section 00641

NOTICE TO PROCEED

Dated:			
TO:	(Bidder)		
ADDRESS:		· ·	
JOB NO.:	J		
PROJECT:			
CONTRACT FOR:			

You are notified the Contract Times under the above contract will commence to run on ______, 20____. By such date, you are to start performing your obligations under the Contract Documents. In accordance with Article 3 of the Agreement the dates of Substantial Completion and completion and readiness for final payment are ______, 20___ and ______, 20___, respectively.

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

Before you may start any Work at the site, you must have submitted the following: Certificate of Insurance, Performance Bond, and Payment Bond.

By:	OWNE	R
Title) ACCEPTANCE OF NOTICE TO PROCEED Contractor) By: (Authorized Signature) (Title)	Ву:	
Title) ACCEPTANCE OF NOTICE TO PROCEED Contractor) By: (Authorized Signature) (Title)		
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By:(Authorized Signature)(Title)		PIANCE OF NOTICE TO PROCEED
(Title)	(Contr	ractor)
	(Contr By:	ractor) (Authorized Signature)
	(Contr By:	ractor) (Authorized Signature)

(Date)

Engineers Joint Documents Committee Design and Construction Related Documents Instructions and License Agreement

Instructions

Before you use any EJCDC document:

- 1. Read the License Agreement. You agree to it and are bound by its terms when you use the EJCDC document.
- 2. Make sure that you have the correct version for your word processing software.

How to Use:

- 1. While EJCDC has expended considerable effort to make the software translations exact, it can be that a few document controls (e.g., bold, underline) did not carry over.
- Similarly, your software may change the font specification if the font is not available in your system. It will choose a font that is close in appearance. In this event, the pagination may not match the control set.
- 3. If you modify the document, you must follow the instructions in the License Agreement about notification.
- 4. Also note the instruction in the License Agreement about the EJCDC copyright.

License Agreement

You should carefully read the following terms and conditions before using this document. Commencement of use of this document indicates your acceptance of these terms and conditions. If you do not agree to them, you should promptly return the materials to the vendor, and your money will be refunded.

The Engineers Joint Contract Documents Committee ("EJCDC") provides **EJCDC Design and Construction Related Documents** and licenses their use worldwide. You assume sole responsibility for the selection of specific documents or portions thereof to achieve your intended results, and for the installation, use, and results obtained from **EJCDC Design and Construction Related Documents**.

You acknowledge that you understand that the text of the contract documents of **EJCDC Design and Construction Related Documents** has important legal consequences and that consultation with an attorney is recommended with respect to use or modification of the text. You further acknowledge that EJCDC documents are protected by the copyright laws of the United States.

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- 2. Use **EJCDC Design and Construction Related Documents** in printed form for bona fide contract documents.
- 3. Copy **EJCDC Design and Construction Related Documents** into any machine readable or printed form for backup or modification purposes in support of your use of **EJCDC Design and Construction Related Documents**.

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- Reproduce and include EJCDC's copyright notice on any printed or machine-readable copy, modification, or portion merged into another document or program. All proprietary rights in EJCDC Design and Construction Related Documents are and shall remain the property of EJCDC.
- 2. Not represent that any of the contract documents you generate from **EJCDC Design and Construction Related Documents** are EJCDC documents unless (i) the document text is used without alteration or (ii) all additions and changes to, and deletions from, the text are clearly shown.

You may not use, copy, modify, or transfer EJCDC Design and Construction Related Documents, or any copy, modification or merged portion, in whole or in part, except as expressly provided for in this license. Reproduction of EJCDC Design and Construction Related Documents in printed or machine-readable format for resale or educational purposes is expressly prohibited.

If you transfer possession of any copy, modification or merged portion of EJCDC Design and Construction Related Documents to another party, your license is automatically terminated.

<u>Term:</u>

The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

Limited Warranty:

EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EJCDC does not warrant that the functions contained in EJCDC Design and Construction Related Documents will meet your requirements or that the operation of EJCDC Design and Construction Related Documents will be uninterrupted or error free.

Limitations of Remedies:

EJCDC's entire liability and your exclusive remedy shall be:

- 1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or
- 2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

General:

You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

> Arthur Schwartz, Esq. General Counsel

National Society of Professional Engineers 1420 King Street Alexandria, VA 22314

Phone: (703) 684-2845 Fax: (703) 836-4875 e-mail: aschwartz@nspe.org

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement. This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by









AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

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Endorsed by



CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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

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

- 12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
- 13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
- 14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
- 15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
- 16. Cost of the Work—See Paragraph 11.01 for definition.
- 17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
- 18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
- 19. Engineer—The individual or entity named as such in the Agreement.
- 20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
- 21. General Requirements—Sections of Division 1 of the Specifications.
- 22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
- 23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
- 24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
- 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.

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- 27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
- 28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
- 29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
- 30. PCBs—Polychlorinated biphenyls.
- 31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
- 32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
- 33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
- 34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
- 35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
- 36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
- 37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
- 38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
- 39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

- 40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
- 41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
- 42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
- 43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
- 44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, 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.
- 45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
- 46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
- 47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
- 48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
- 49. Unit Price Work—Work to be paid for on the basis of unit prices.
- 50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
- 51. Work Change Directive—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

- A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives:
 - 1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" 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.

C. Day:

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

D. *Defective:*

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

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

ARTICLE 2 – PRELIMINARY MATTERS

- 2.01 Delivery of Bonds and Evidence of Insurance
 - A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
 - B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.
- 2.02 *Copies of Documents*
 - A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. 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 in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 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 start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 Before Starting Construction

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

2.06 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 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 if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

- 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
- 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

- 3.01 Intent
 - A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
 - B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. 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.

3.02 Reference Standards

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

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies:

- 1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
- 2. Contractor's Review of Contract Documents During Performance of Work: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
- 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.
- B. Resolving Discrepancies:
 - 1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

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

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

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
 - 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.
- 3.06 *Electronic Data*
 - A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
 - B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
 - C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

4.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.
- 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; and
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
 - 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, 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 be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
 - 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
- 3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 Underground Facilities

- A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
- B. Not Shown or Indicated:
 - 1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

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

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

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.

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

5.02 *Licensed Sureties and Insurers*

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

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 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 Paragraph 5.06 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 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 in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's
interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 Partial Utilization, Acknowledgment of Property Insurer

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

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 Supervision and Superintendence

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

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, testing, start-up, and completion of the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 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 the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.
- 6.05 Substitutes and "Or-Equals"
 - A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. "Or-Equal" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
- 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- 2. Substitute Items:
 - a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
 - b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
 - c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
 - d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
- 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for 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. 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, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will 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.

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

6.09 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas:

- 1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
- 2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
- 3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 Record Documents

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

6.14 Safety Representative

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

6.15 Hazard Communication Programs

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

6.16 *Emergencies*

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

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

- 6.17 *Shop Drawings and Samples*
 - A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.
 - 1. Shop Drawings:
 - a. Submit number of copies specified in the General Requirements.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.
 - 2. Samples:
 - a. Submit number of Samples specified in the Specifications.
 - b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.
 - B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
 - C. Submittal Procedures:
 - 1. Before submitting each Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

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

E. Resubmittal Procedures:

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

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 Contractor's General Warranty and Guarantee

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

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

- 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 preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.
- 6.21 Delegation of Professional Design Services
 - A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
 - B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
 - C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
 - D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

- 7.01 *Related Work at Site*
 - A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
 - B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors between Owner and such utility owners and other contractors.
 - C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

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

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- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.
- 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.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

- 8.01 Communications to Contractor
 - A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.
- 8.02 Replacement of Engineer
 - A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.
- 8.03 Furnish Data
 - A. Owner shall promptly furnish the data required of Owner under the Contract Documents.
- 8.04 Pay When Due
 - A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.
- 8.05 Lands and Easements; Reports and Tests
 - A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 8.06 *Insurance*
 - A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 Change Orders

- A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.
- 8.08 Inspections, Tests, and Approvals
 - A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.
- 8.09 Limitations on Owner's Responsibilities
 - A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 8.10 Undisclosed Hazardous Environmental Condition
 - A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.
- 8.11 Evidence of Financial Arrangements
 - A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.
- 8.12 Compliance with Safety Program
 - A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

- 9.01 *Owner's Representative*
 - A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.
- 9.02 Visits to Site
 - A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

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

9.04 Authorized Variations in Work

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

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

- 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 determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.
- 9.08 Decisions on Requirements of Contract Documents and Acceptability of Work
 - A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
 - B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
 - C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
 - D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.
- 9.09 Limitations on Engineer's Authority and Responsibilities
 - A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise

or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.
- 9.10 Compliance with Safety Program
 - A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

- 10.01 Authorized Changes in the Work
 - A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
 - 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.

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

- 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 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 supporting data

shall be delivered to the Engineer and the other party to the Contract within 60 days 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.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 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.
- 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, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 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 (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 under Paragraph 12.01.B.2, 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;
 - 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;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.
- 12.02 Change of Contract Times
 - A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
 - B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.
- 12.03 Delays
 - A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

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

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

- 13.01 Notice of Defects
 - A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.
- 13.02 Access to Work
 - A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

- A. Contractor 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.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all 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.

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.

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.

13.07 Correction Period

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

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

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time 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 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 an

Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

- 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
- 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- B. *Review of Applications:*
 - 1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 - 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
 - 3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or

involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
- 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
- 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.
- C. Payment Becomes Due:
 - 1. Ten 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.
- 14.03 Contractor's Warranty of Title
 - A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.
- 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.
 - B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
 - C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before

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

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.
- 14.05 Partial Utilization
 - A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

- 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.
- 14.06 Final Inspection
 - A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.
- 14.07 Final Payment
 - A. Application for Payment:
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
 - 2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
 - 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
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 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.

C. Payment Becomes Due:

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

14.08 Final Completion Delayed

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

14.09 Waiver of Claims

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

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 Owner May Terminate for Cause

- A. The occurrence of any one or more of the following events will justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 - 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 - 3. Contractor's repeated disregard of the authority of Engineer; or
 - 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- 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:
 - 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 the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 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.
 - B. 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.

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, to the last business address known to the giver of the notice.

17.02 Computation of Times

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

17.03 Cumulative Remedies

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

17.04 Survival of Obligations

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

17.05 Controlling Law

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

17.06 Headings

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

INDEX TO

SECTION 01011

SUMMARY OF WORK

Paragra	ph Title	Page
PART 1 –	GENERAL	
1.1	Section Includes	01011-1
1.2	Contract Description	01011-1
1.3	Work Required	01011-1
1.4	Contract Drawings	01011-2
1.5	Contract Technical Specifications	01011-2
1.6	Work Schedule	01011-3

PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

SECTION 01011

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Contract Description.
- B. Work required by Contract.
- C. Contract Drawings.
- D. Contract Technical Specifications.
- E. Owner supplied Products.
- F. Contractor use of site [and premises].
- G. Future work.
- H. Work Schedule.
- I. Owner occupancy.
- J. Definitions.

1.2 CONTRACT DESCRIPTION

A. Contract Type: 00506 - Agreement

1.3 WORK REQUIRED

A. Consists of Contractor furnishing all labor, materials, tools, equipment and incidentals to complete the Work generally described below:

Structural repairs to two culverts under Elam Drive in McCormick County, South Carolina. Rehabilitation of the culverts includes the installation of a Snap-Tite liner on three (3) 48-inch Corrugated Metal Pipes (CMP), complete removal and replacement of one (1) undersized 18-inch CMP with a 24-inch Reinforced Concrete Pipe (RCP), installation of headwalls at the ends of both culverts. Project also includes a maintenance repair on a culvert under Little River Drive involving the installation of a Snap-Tite liner on one (1) 18-inch CMP.

- B. All work shall be performed as shown on the Drawings and as described in the Contract Documents and Technical Specifications.
- C. All work shall comply with standards described by the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Subpart P, latest revision.

1.4 CONTRACT DRAWINGS

SHEET NO.	TITLE	DATE	FILE NUMBER
C0	COVER SHEET	10/19/2023	
G0.1	GENERAL NOTES AND INDEX	10/19/2023	
EX1.1	EXISTING CONDITIONS – ELAM DR	10/19/2023	
EX1.2	EXISTING CONDITIONS – LITTLE RIVER DR	10/19/2023	
DM1.1	DEMOLITION PLAN – ELAM DR	10/19/2023	
EC0.1	EROSION CONTROL NOTES	10/19/2023	
EC0.2	EROSION CONTROL NOTES	10/19/2023	
EC1.1	EROSION CONTROL PLAN – ELAM DR	10/19/2023	
EC1.2	EROSION CONTROL PLAN – LITTLE RIVER DR	10/19/2023	
EC4.1	EROSION CONTROL DETAILS	10/19/2023	
C1.1	PAVING, GRADING, AND DRAINAGE PLANS – ELAM DR	10/19/2023	
C1.2	PAVING, GRADING, AND DRAINAGE PLANS – LITTLE RIVER DR	10/19/2023	
C2.1	DRAINAGE PROFILES	10/19/2023	
C3.1	PAVING, GRADING, AND DRAINAGE DETAILS	10/19/2023	

1.5 CONTRACT TECHNICAL SPECIFICATIONS

SECTION NO.	TITLE
02070	Selective Demolition
02110	Site Clearing
02111	Site Preparation
02204	Earthwork
02210	Soil Erosion Control
02231	Aggregate Base Course
02275	Rip–Rap
02512SC	Asphaltic Concrete Binder/Surface Courses (South Carolina)
02560	Flowable Fill
02570	Traffic Control
02575	Surface Restoration
02720	Storm Drainage
02722	Water Management Services
02902	Grassing
Appendix A	Snap-Tite Culvert Lining Field Guide

1.6 WORK SCHEDULE

A. Construct Work in stages to accommodate Owner's requirements during the construction period, coordinate construction schedule and operations with Engineer.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

Not used

END OF SECTION

INDEX TO

SECTION 01025

MEASUREMENT AND PAYMENT

Paragraph	Title	Page
PART 1 - GEN	ERAL	
1.1	Section Includes	01025-1
1.2	Authority	01025-1
1.3	Unit Quantities Specified	01025-1
1.4	Measurement of Quantities	01025-1
1.5	Payment	01025-2

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Measurement and payment criteria applicable to the Work performed under a unit price payment method.

1.2 AUTHORITY

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. The Engineer will verify measurements and quantities.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.3 UNIT QUANTITIES SPECIFIED

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer determine payment.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

1.4 MEASUREMENT OF QUANTITIES

- A. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- B. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- C. Measurement by Area: Measured by square dimension using mean length and width or radius.
- D. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.
- E. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

1.5 PAYMENT

- A. Payment Includes: Full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work including overhead and profit.
- B. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit sum/price for Work which is incorporated in or made necessary by the Work.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01135

BIDDER'S QUALIFICATIONS

Please answer all questions and have your statement notarized. If necessary, you may answer questions on separate sheets of paper and attach them to this statement. Other additional information your firm deems useful in the evaluation of your capabilities may also be included.

1. ORGANIZATION

Date of Response:				
Legal Name of Bidde	r:			
Street Address:				
City, State, Zip Code:				
Website:				
Contact:	Phone:	Mobile:		
Email Address:				
Is the address of the B Main Office	ousiness listed above a: (Please o Regional Office Branch C	circle one listed below) Office		
When Organized:				
When and Where Inc	orporated:			
Licensed or Registere	d To Do Business in State of <u>South</u>	<u>a Carolina</u> : Yes <u>No</u>		
If No, In What (State)	Municipality doe	s your Company Have A Business License?_		
Business License Number for Said (State)Municipality:				
Federal Employer I.D.	Number:			
If Partnership, list all partners and their addresses:				

If there is no South Carolina Partner, give name and address of agent for service of process in South Carolina.

If an individual owner is not a South Carolina resident, give name and address of agent for service of process in South Carolina.

Is your company: (Please circle one listed below)

MBE WBE DBE MBE/WBE/DBE Certified by:

Has your company or any of its principals ever petitioned for bankruptcy, failed in business, defaulted or been terminated on a contract awarded to you?

_____Yes _____No

Has your company ever been banned or otherwise precluded from pursuing public work or have ever been found to be non-responsive by a public agency?

_____Yes _____No

Has your company ever had a claim made against it for improper, delayed, or non-compliant work or failure to meet warranty obligations?

_____Yes _____No

Is your company or any of its owners, officers, or major shareholders currently involved in any arbitration or litigation?

_____ Yes _____ No

Does your company have any outstanding judgments or claims against it?

_____Yes _____No

Is your company currently involved or has been involved in the last 3 years with any litigation?

_____ Yes _____ No

Has your organization ever failed to complete any work awarded to it?

_____Yes _____No

If yes to any of the above questions, please explain:_____

Please list any litigation brought against your company in the past five (5) years asserting that you failed to make payments to anyone.
Has your company ever had a contract terminated for any reason?
If Yes, please explain:
List the geographical areas in which you work:
List the areas of work that you normally perform with your own forces:
What percentage of the Company's work is normally subcontracted?%
Amount \$ Year
Project Name / Scope / Contact Information
Should the work require compliance with the South Carolina State Construction Licensing Board Rules and Regulations, the Contractor and any Subcontractor shall list the appropriate License number(s):
Main Contractor's License Number:
Subcontractor #1 License Number:
Subcontractor #1 Name:

Subcontractor #2 License Number:					
Subcontractor #2 Name:					
Subcontractor #3 License Number:					
Subcontractor #3 Name:					
(List additional if appropriate)					
Year Firm Established:					
2. EXPERIENCE					
How many years have you been engaged in the contracting business under your present firm or trade name?					
List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.					
Current Employment (Numbers of Employees): Total:					
Management: Clerical: Professional:					
Technical:					
Total Value of Projects Completed (last five years): \$					

A. Contracts On Hand

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Anticipated Completion Date

B. Selected Similar Construction Project Examples

At Least Five (5) Projects Similar in Nature:

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Completion Date

C. Safety Issues Disclosure:

Contractor's Experience Modification Rate (EMR): List Safety Issues for Last Five Years:

List Major Equipment Proposed To Be Used For This Project:

Description	Make/Model	Owned by Bidder or Sub?	Year Purchased
		Yes No	

D. Proposed Superintendent for this Project:

Name:_____

Address:

E. Select Project Experience of the Superintendent:

Project Name and Location	Owner Name Address Phone No.	Project Description	Bid \$	Actual \$	Completion Date

3. **REFERENCES**

Name of your Bank:			
Address:			
Phone:Cor	ntact Person:		
Amount of line of credit:	Amount Available:		
Bonding Company:			
Address:			
Contact Person:	Phone:		
Bonding Company's Rating:			
Bonding Capacity: Per Job \$	Aggregate \$		
Date of Last Bond:	Bond Amount \$		
Bond Rate: Remaining	Bonding Capacity \$		
Please list the persons or entities that provide indemnification to your Surety:			
<u></u>			

List three of your major suppliers:

А.	Company:			
	Address:			
	Phone:	Fax:		
	Contact:			
R	Company			
D.	Address:			
	Phone:	Fax.		
	Contact:			
0	0			
C.	Company:			
	Address:	F		
	Contact:	Fax:		
	contact.			
List thre	ee Contractors/Owners you	to business with:		
А.	Company:			
	Address:			
	Phone:	Fax:		
	Contact:			
В.	Company:			
	Address:			
	Phone:	Fax:		
	Contact:			
C.	Company:			
	Address:			
	Phone:	Fax:		
	Contact:			

4. SIGNATURE

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading. The undersigned also recognizes that the Owner is relying on the accuracy of the information and the responses in deciding the demonstrated competence and qualifications for the type of required work.

The foregoing statement of qualifications is submitted under oath:

Respectfully submitted:
Company Name:
Street Address:
City, State, Zip:
By (Signed):
By (Typed):
Title:

Attach satisfactory evidence of the authority of the officer, or officers, signing on behalf of a corporation.

SWORN to before me this

_____ Day of _____, 20____

_____(SEAL)

Notary Public for _____

My Commission Expires: _____

INDEX TO

DIVISION I – GENERAL REQUIREMENTS

SECTION 01300

SUBMITTALS

Paragraph	Title	

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1.4	Construction Progress Schedules	01300-2
1.5	Product Data	01300-2
1.6	Shop Drawings	01300-3
1.7	Samples	01300-4
1.8	Design Data	01300-4
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1.12	Manufacturer's Field Reports	01300-5
1.13	Erection Drawings	01300-5
1.14	Reviewed Shop Drawings	01300-5
1.15	Submittal Checklist	01300-6

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

Page

DIVISION I – GENERAL REQUIREMENTS

SECTION 01300 – SUBMITTALS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product Data.
- D. Shop Drawings.
- E. Samples.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Erection drawings.

1.2 **RELATED SECTIONS**

- A. Section 01400 Quality Control: Manufacturers' field services and reports.
- B. Section 01702 Closeout Procedures: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix. Resubmit as specified for initial submittal. Indicate on revised drawings all changes that have been made other than those requested by the Engineer.
- C. Identify Project, Contractor, Subcontractor, or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed verifying review, approval, products required, field dimensions, adjacent construction Work, and coordination of

information is in accordance with the requirements of the Work and Contract Documents. Submittal without the Contractor's stamp will be returned to Contractor without Engineer's review.

- E. 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. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal. Coordinate submission of related items. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
- F. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed Work.
- G. Provide space for Contractor and Architect/Engineer review stamps.
- H. When revised for resubmission, identify all changes made since previous submission.
- I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within 15 days after date of Owner-Contractor Agreement.
- B. Revise and resubmit as required.
- C. Submit a computer generated or horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- E. Indicate estimated percentage of completion for each item of Work at each submission.
- F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by allowances.

1.5 PRODUCT DATA

- A. Product Data For Review:
 - 1. Submitted to Engineer for review and conformance with information given in specifications and the design concept expressed in contract documents.

- 2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above.
- B. Submit the number of copies Contractor and Owner require, plus two copies retained by Engineer.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, distribute in accordance with the Submittal Procedures article above.

1.6 SHOP DRAWINGS

- A. Contractor shall submit a minimum 5 copies of each shop drawing to the Engineer for review.
- B. Submitted to Engineer for review and conformance with information given in specifications and design concept expressed in contract documents. Review of shop drawings by Engineer shall not relieve Contractor of its responsibility for accuracy of shop drawings nor for furnishing of all materials and equipment required by the contract even though such items may not be indicated on shop drawings reviewed by Engineer.
- C. Shop drawings shall include applicable technical information, drawings, diagrams, performance curves, schedules, templates, calculations, instructions, measurements, and similar information as applicable to the specific item for which shop drawing is prepared.
- D. Do <u>not</u> use Engineer's Drawings for shop or erection purposes.
- E. Each shop drawing copy shall bear a Contractor's stamp showing they have been checked. Shop drawings submitted to the Engineer without Contractor's stamp will be returned to Contractor without review.

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 shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to Engineer.

Schedule of Submittals: Within 30 days of Contract award and prior to any shop drawing submittal, Contractor shall submit a schedule showing the estimated submittal date and desired acceptance date for each shop drawing anticipated. Time lost due to unacceptable submittals shall be the Contractor's responsibility.

1.7 SAMPLES

- A. Samples For Review:
 - 1. Submitted to Engineer for review and conformance with information given in specifications and design concept expressed in contract documents.
 - 2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above.
- B. Samples For Information:
 - 1. Submitted for Engineer's knowledge as contract administrator or for the Owner.
- C. Include identification on each sample, with full product information.
- D. Submit the number of samples specified in individual specification sections; one of which will be retained by Engineer.
- E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- F. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.8 DESIGN DATA

- A. Submit for Engineer's knowledge as contract administrator or for the Owner.
- B. Submit for information and conformance with information given in specifications and design concept expressed in contract documents.

1.9 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for the Owner.
- B. Submit test reports for information and assessing conformance with information given in specifications and design concept expressed in contract documents.

1.10 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Refer to Section 01400 Quality Control, Manufacturers' Field Services article.

1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Engineer's benefit as contract administrator or for the Owner.
- B. Submit report in duplicate within 30] days of observation to Engineer for information.
- C. Submit for information and assessing conformance with information given in specifications and design concept expressed in contract documents.

1.13 ERECTION DRAWINGS

- A. Submit drawings for Engineer's benefit as contract administrator or for the Owner.
- B. Submit for information and assessing conformance with information given in specifications and design concept expressed in contract documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by the Engineer or Owner.

1.14 REVIEWED SHOP DRAWINGS

- A. Engineer Review.
 - 1. Acceptable submittals will be marked "No Exceptions Taken." A minimum of three copies will be retained by the Engineer for Engineer's and Owner's use and remaining copies will be returned to Contractor.
 - 2. Submittals requiring minor corrections before the product is acceptable will be marked "Furnish as Corrected." Contractor may order, fabricate, and ship items included in submittals, provided the indicated corrections are made.
 - 3. Submittals marked "Revise and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
 - 4. The "Rejected" notation is used to indicate products not acceptable. Upon return of a submittal so marked, Contractor shall repeat the initial review procedure utilizing acceptable products.

- 5. Only two copies of items marked "Revise and Resubmit" and "Rejected" will be reviewed and marked. One copy will be retained by Engineer and the other copy with all remaining unmarked copies will be returned to Contractor for resubmittal.
- B. No Work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" or "Furnish as Corrected" notation. Contractor shall maintain at the job site a complete set of shop drawings bearing Engineer's stamp.
- C. Substitutions: In the event Contractor obtains Engineer's acceptance for use of products other than those listed first in Contract Documents, Contractor shall, at Contractor's own expense and using methods accepted by Engineer, make any changes to structures, piping and electrical work necessary to accommodate these products.
- D. Use of "No Exceptions Taken" or "Furnish as Corrected" notation on shop drawings or other submittals is general and shall not relieve Contractor of the responsibility of furnishing products of proper dimension, size, quality, quantity, materials, all performance characteristics, and to efficiently perform requirements and intent of Contract Documents. Engineer's review shall not relieve Contractor of the responsibility of errors of any kind on shop drawings. Review is intended only to assure conformance with design concept of the project and compliance with information given in Contract Documents.

1.15 SUBMITTAL CHECKLIST

A. This checklist is not necessarily complete. Contractor is responsible to submit all items and materials as specified in each section.

Section	Submittal	Date Received	Accepted Submittal Returned to	Submittal Rejected &	Comments	
3601011	300111101	Dyroen	Owner/Connuctor	Reformed	Comments	
02204 – E	arthwork			1		
	Borrow					
02210 – S	oil Erosion Control					
	Silt Fence					
02231 – A	ggregate Base Course					
	Aggregate					
	Prime					
02237 – S	02237 – Soil Cement Base Course					
	Mix Design					

			Accepted			
		Date Posoivod	Submittal Returned to	Submittal Rejected 8		
Section	Submittal	by T & H	Owner/Contractor	Returned	Comments	
		~,				
	Prime					
02275 - P	02275 Bin Ben					
	Stone					
	Sand-Cement Bag					
	Filter Fabric					
02484 – C	oncrete Bulkhead					
	Design Data					
	Precast Members					
	Driving Equipment					
	Premolded Expansion Joint Fillers					
	Hardware					
	Concrete Mix Design					
	Filter Fabric					
02511 – A	sphaltic Concrete Base C	ourse	I	I		
	Asphalt Cement					
	Anti-Stripping Agent					
	Mix Design					
02512 – Asphaltic Concrete Binder/Surface Courses						
	Tack Coat					
	Asphalt Cement					
	Anti-Stripping Agent					
	Mix Designs					

		Date	Accepted Submittal	Submittal	
		Received	Returned to	Rejected &	
Section	Submittal	by T & H	Owner/Contractor	Returned	Comments
02720 – S	torm Drainage	1		1	
	Reinforced Concrete Pipe				
	Gaskets				
	Drainage Structures				
	Filter Fabric				
02902 – G	Frassing	I	I	I	
	Seed Mix – Temporary				
	Seed Mix – Permanent				
	Fertilizer				
	Lime				
03305 – S	ite Concrete			1	
	Mix Design				
	Curing Compounds				
	Joint Filler				
	Reinforcing Steel				
	Welded Wire Fabric				
	Dowels				
	Fiber Reinforcement				
03310 – Cast-In-Place Concrete					
	Mix Design				
	Reinforcing Steel				
	Welded Wire Fabric				
	Curing Compound				

		Date Received	Accepted Submittal Returned to	Submittal Rejected &	
Section	Submittal	by T & H	Owner/Contractor	Returned	Comments
	Fiber Reinforcement				
	Non-Shrink Grout				
	Joint Filler				
03410 – Structural Precast Concrete					
	Mix Design				
	Reinforcement				
	Layout Plan				
	Design Loads				

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION

INDEX TO

SECTION 01400 - QUALITY CONTROL

Paragra	ph Title	Page
PART 1 –	GENERAL	
1.1	Section Includes	01400-1
1.2	Related Sections	01400-1
1.3	Quality Assurance - Control of Installation	01400-1
1.4	Tolerance	01400-1
1.5	References and Standards	01400-2
1.6	Testing Services	01400-2
1.7	Manufacturer's Field Services	01400-3

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1	Examination	01400-3
3.2	Preparation	01400-3

SECTION 01400

QUALITY CONTROL

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance control of installation.
- B. Tolerances
- C. References and standards.
- D. Testing laboratory services.
- E. Manufacturer's field services.

1.2 **RELATED SECTIONS**

- A. Section 01300 Submittals: Submission of manufacturer's instructions and certificates.
- B. Section 01410 Testing Services.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions and position before securing in place.
- D. Accessible routes shall not exceed maximum ADA allowable slopes.

1.5 REFERENCES AND STANDARDS

- A. For products or workmanship specified by association, trade, or other consensus standards, complies with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current with date specified in the individual specification sections, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract or those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 TESTING SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent firm to perform testing. Contractor shall pay for all retesting of failed tests.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Owner.
- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Owner.
- D. Reports will be submitted by the independent firm to the Engineer, Contractor, and owner indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Architect/Engineer and independent firm 48 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- F. Testing does not relieve Contractor to perform Work to contract requirements.

G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for re-testing will be made by the Contractor.

1.7 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to approval of Engineer and Owner.
- C. Report observations and site decisions or instructions given to applicators or installers supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01300 SUBMITTALS, MANUFACTURER'S FIELD REPORTS article.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of the correct characteristics, and in the correct locations.

3.2 **PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

INDEX TO

SECTION 01410 - TESTING SERVICES

Paragraph

Title

Page

PART 1 – GENERAL

1.1	Section Includes	01410-1
1.2	Related Sections	01410-1
1.3	References	01410-1
1.4	Selection and Payment	01410-2
1.5	Quality Assurance	01410-2
1.6	Contractor Submittal	01410-2
1.7	Testing Agency Responsibilities	01410-3
1.8	Testing Agency Reports	01410-3
1.9	Limits on Testing Authority	01410-3
1.10	Contractor Responsibilities	01410-4
1.11	Schedule of Tests	01410-4

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.
SECTION 01410

TESTING SERVICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Selection and payment.
- B. Contractor submittals.
- C. Testing agency responsibilities.
- D. Testing agency reports.
- E. Limits on testing authority.
- F. Contractor responsibilities.
- G. Schedule of tests.

1.2 RELATED SECTIONS

- A. Testing and approvals required by public authorities.
- B. Section 01300 Submittals: Manufacturer's certificates.
- C. Section 01702 Contract Closeout: Project record documents.

1.3 REFERENCES (LATEST REVISION)

- A. ASTM C 802 Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials.
- B. ASTM C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- C. ASTM C 1093 Practice for Accreditation of Testing Agencies for Masonry.
- D. ASTM D 3740 Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- E. ASTM D 4561 Practice for Quality Control Systems for Organizations Producing and Applying Bituminous Paving Materials.
- F. ASTM E 329 Specification for Agencies Engaged in Construction Inspection and/or Testing.
- G. ASTM E 543 Practice for Agencies Performing Nondestructive Testing.

- H. ASTM E 548 Guide for General Criteria Used for Evaluating Laboratory Competence.
- I. ASTM E 699 Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components.

1.4 SELECTION AND PAYMENT

- A. Owner will employ and pay for services of an independent testing agency or laboratory to perform specified testing. Contractor shall pay for all retesting of failed tests.
- B. Employment of testing agency or laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of practices listed in paragraph 1.3.
- B. Laboratory: Authorized to operate in State in which project is located.
- C. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.6 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.7 TESTING AGENCY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
- C. Perform specified sampling and testing of products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.

- F. Perform additional tests required by Engineer.
- G. Attend preconstruction meetings and progress meetings.

1.8 TESTING AGENCY REPORTS

- A. After each test, promptly submit two copies of report to Engineer and to Contractor.
- B. Include:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and specifications section.
 - 6. Location in the Project.
 - 7. Type of inspection or test.
 - 8. Date of test.
 - 9. Results of tests.
 - 10. Conformance with Contract Documents.
- C. When requested by Engineer, provide interpretation of test results.

1.9 LIMITS ON TESTING AUTHORITY

- A. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Agency or laboratory may not approve or accept any portion of the Work.
- C. Agency or laboratory may not assume any duties of Contractor.
- D. Agency or laboratory has no authority to stop the Work.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Deliver to agency or laboratory at designated location, adequate samples of materials proposed to be used requiring testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to the Work.
- C. Provide incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the site or at source of products to be tested.
 - 3. To facilitate tests.
 - 4. To provide storage and curing of test samples.
- D. Notify Engineer and laboratory 48 hours prior to expected time for operations requiring testing services.

1.11 SCHEDULE OF TESTS

Section	Test	Frequency	Date	Performed By	Notes
02204 – Earthwork					
	Compaction				
	Unpaved	1 test per horizontal layer			
		per 10,000 sf of fill area			
	Paved	1 test per horizontal layer			
		per 5,000 sf of subarade			
		1 test per horizontal laver			
	Buildina Pad	per 1,500 sf of fill greg			
	Curb & autter	1 test per 300 lf			
	Proof Rolling	As necessary			
	l'icernemig				
02231 -	Aggregate Base	Course	•	•	•
	Base Density	1 test per 5,000 sf			
02237 -	Soil Cement Base	Course		•	1
	Compressive	1 test per 5.000 sf			
	Strength				
	Base Density	1 test per 5.000 sf			
02511 -	Asphaltic Concre	ete Base Course	1	1	I
	Asphalt	1 test per each 250 tons			
	Extraction &	placed			
	Gradation				
	Marshall	1 test per each 250 tons			
	Stability	placed			
	Core	1 test for each 250 tons			
	0010	placed			
	Field Density	1 test per 5,000 sf			
02512 -	Asphaltic Concre	te Binder/Surface courses			
02312 -	Asphalt	1 test for each 250 tons			
	Extraction 8	placed			
	Gradation	placed			
	Marshall	1 test for each 250 tons			
	Stability	nlaced			
	Field Density	1 test for each 250 tons			
		placed			
	Cores	1 test for each 250 tons			
	COIES	placed			
02720 -	Storm Drainage	pideod			
	Compaction				
	Traffic Areas	1 per 100 lf or less for			
		each 4 ft. of depth			
	Non-Traffic	1 per 500 lf or less for			
		each 6 ft. of depth			
03305 -	Site Concrete	1	1	1	1
	Mix Designs	1 per mix design			
	Compressive	3 test cylinders for every			
	Strength	50 cubic yards or less of			
		each mix design placed			
		daily			

Section	Test	Frequency	Date	Performed By	Notes
		1 cylinder broken at 7			
		days			
		2 cylinders broken at 28			
		days			
	Slump	1 test for each set of			
		cylinders taken			
03310 -	Cast-in-Place Co	ncrete			
	Materials	As necessary			
	Mix Designs	1 per mix design			
	Strength	4 Test Cylinders for each			
		50 cy or less or each mix			
		design placed daily			
	Slump	1 test per each set of			
		cylinders			
	Air Content	1 test per each set of			
		cylinders			
	Temperature	1 test per each set of			
		cylinders			

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

INDEX TO

SECTION 01702 – CONTRACT CLOSEOUT

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1.3	Closeout Procedures		01702-1
1.4	Final Cleaning		01702-1
1.5	Adjusting		01702-1

1.5Adjusting01702-11.6Project Record Documents01702-2

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

SECTION 01702

CONTRACT CLOSEOUT

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Project record documents.
- C. Operation and maintenance data.
- D. Warranties and bonds.
- E. Maintenance service.

1.2 **RELATED SECTIONS**

- A. Section 01300 Submittals
- B. Operation and Maintenance Data.
- C. Warranties.
- D. Bonds.

1.3 CLOSEOUT PROCEDURES

- A. Submit written verification Contract Documents being reviewed, Work has been observed at appropriate times, and Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 FINAL CLEANING

- A. Execute final cleanup prior to final project assessment.
- B. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.5 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Equipment Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
- F. Project Record Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 3. Where proposed and existing utilities cross, the Contractor shall measure and record the horizontal location and vertical separation between each crossing. Separation shall be measured between exteriors and pipes.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
 - 6. Piling data locations, tip and cut-off elevations, and driving records.
- G. Submit documents to Engineer with claim for final Application for Payment.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

INDEX TO

SECTION 01730 - OPERATION AND MAINTENANCE

Paragraph Title Page PART 1 - GENERAL 1.1 Section Includes 01730-1 1.2 **Related Sections** 01730-1 1.3 01730-1 Quality Assurance 1.4 Format 01730-1 Contents of Each Volume 01730-2 1.5 Manual for Materials and Finishes 01730-2 1.6 1.7 Manual for Equipment and Systems 01730-3 Instruction of Owner Personnel 01730-4 1.8 1.9 **Submittals** 01730-4

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Format and content of manuals.
- B. Instruction of Owner's personnel.
- C. Schedule of submittals.

1.2 **RELATED SECTIONS**

- A. Section 01300 Submittals
- B. Section 01400 Quality Control.
- C. Section 01702 Contract Closeout
- D. Section 01740 Warranties.
- E. Section 01741 Bonds.
- F. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.4 FORMAT

- A. Prepare data in the form of an instructional manual.
- B. Binders: Commercial quality, 8-1/2 x 11, three D side ring binders with durable plastic covers; 2 maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- D. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- E. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

- F. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- G. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

1.5 CONTENTS OF EACH VOLUME

- A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, Subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties: Bind in copy of each.
- G. Bonds: Bind in photocopy of each.

1.6 MANUAL FOR MATERIALS AND FINISHES

- A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured Products.
- B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual Product specification sections.
- E. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

1.7 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- C. Include color-coded wiring diagrams as installed.
- D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- F. Provide servicing and lubrication schedule, and list of lubricants required.
- G. Include manufacturer's printed operation and maintenance instructions.
- H. Include sequence of operation by controls manufacturer.
- I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- J. Provide control diagrams by controls manufacturer as installed.
- K. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- L. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- M. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- N. Include test and balancing reports.
- O. Additional Requirements: As specified in individual product specification sections.
- P. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.8 INSTRUCTION OF OWNER PERSONNEL

- A. Before final walk through, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
- B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.
- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.9 SUBMITTALS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit 1 copy of completed volumes 15 days prior to final walk through. This copy will be reviewed and returned, with Architect/Engineer comments. Revise content of all document sets as required prior to final submission.
- D. Submit two sets of revised final volumes in final form within 10 days after final walk through.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

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SECTION 01740 – WARRANTIES

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1.4Preparation of Submittals1.5Time of Submittals

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PART 2 – PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

SECTION 01740

WARRANTIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Preparation and submittal of warranties.
- B. Time and schedule of submittals.

1.2 **RELATED SECTIONS**

- A. General Conditions EJCDC: Warranties and correction of work.
- B. Section 01702 Contract Closeout: Contract closeout procedures.
- C. Section 01730 Operation and Maintenance Data.
- D. Individual Specifications Sections: Warranties required for specific Products or Work.

1.3 FORM OF SUBMITTALS

- A. Bind in commercial quality 8-1/2 x 11, three D side ring binders with durable plastic covers.
- B. Cover: Identify each binder with typed or printed title WARRANTIES with title of Project; name, address and telephone number of Contractor and name of responsible company principal.
- C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
- D. Separate each warranty with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.4 **PREPARATION OF SUBMITTALS**

- A. Obtain warranties executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.

D. Retain warranties until time specified for submittal.

1.5 TIME OF SUBMITTALS

- A. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
- B. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

INDEX TO

SECTION 01741 - BONDS

Paragraph Title Page PART 1 – GENERAL Section Includes 01741-1 1.1 1.2 **Related Sections** 01741-1 Form of Submittals 01741-1 1.3 Preparation of Submittals 01741-1 1.4

PART 2 – PRODUCTS

1.5

Not Used

Time of Submittals

PART 3 – EXECUTION

Not Used

01741-2

SECTION 01741

BONDS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Preparation and submittal of bonds.
- B. Time and schedule of submittals.

1.2 RELATED SECTIONS

- A. Document 00021 Invitation to Bid.
- B. Document 00110 Instruction to Bidders.
- C. Document 00411 Bid bonds.
- D. Document General Conditions EJCDC: Performance bond and labor and material payment bonds.
- E. Section 01702 Contract Closeout: Contract closeout procedures.
- F. Section 01730 Operation and Maintenance Data.
- G. Individual Specifications Sections: Bonds required for specific Products or Work.

1.3 FORM OF SUBMITTALS

- A. Bind in commercial quality 8-1/2 x 11, three D side ring binders with durable plastic covers.
- B. Cover: Identify each binder with typed or printed title BONDS with title of Project; name, address and telephone number of Contractor; and name of responsible company principal.
- C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
- D. Separate each bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.4 **PREPARATION OF SUBMITTALS**

A. Obtain bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of

work. Except for items put into use with Owner's permission, leave date of beginning of time of bond until the Date of Substantial completion is determined.

- B. Verify documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain bonds until time specified for submittal.

1.5 TIME OF SUBMITTALS

- A. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
- B. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the bond period.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

Not Used

INDEX TO

SECTION 02070 - SELECTIVE DEMOLITION

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PART 2 – PRODUCTS

None this Section

PART 3 – EXECUTION

3.1	Preparation	02070-2
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SECTION 02070

SELECTIVE DEMOLITION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of selective demolition work is indicated on drawings.

1.3 SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection. Include schedule and location for return of items identified on plans to be delivered to Owner of property.

1.4 JOB CONDITIONS

- A. Condition of Structures: Owner assumes no responsibility for actual condition of items to be demolished.
- B. Partial Demolition and Removal: Items indicated to be removed but of value to Contractor may be removed as work progresses. Transport salvaged items from site as they are removed.

Storage or sale of removed items on site will not be permitted.

C. Protections: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

Protect from damage existing finish work to remain in place and becomes exposed during demolition operations. Remove protections at completion of work.

1.5 DAMAGES

A. Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

1.6 TRAFFIC

A. Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close, block or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways.

1.7 EXPLOSIVES

A. Use of explosives will not be permitted.

1.8 UTILITY SERVICES

A. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

1.9 ENVIRONMENTAL CONTROLS

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

1.10 MEASUREMENT AND PAYMENT

A. There will be no measurement for selective demolition. Payment will be made at the contract lump sum price. Payment will include equipment, labor, materials, protection, clean-up, disposal, and all work necessary to complete the selective demolition shown on the construction drawings.

PART 2 – PRODUCTS

None in this section

PART 3 – EXECUTION

3.1 **PREPARATION**

- A. Prior to commencement of selective demolition work, check areas in which work will be performed. Photograph or video existing conditions of surfaces, equipment, or surrounding properties that could be misconstrued as damage resulting from selective demolition work. File with Owner's representative prior to starting work.
- B. Cover and protect equipment and fixtures to remain from soiling or damage when demolition work is performed in areas from which such items have not been removed.

3.2 DEMOLITION

A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

Demolish concrete in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw or hand tools. Do not use power-driven impact tools.

Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel and sand, free of trash and debris, stones over 2" diameter, roots or other organic matter.

If unanticipated mechanical, electrical, or structural elements, which conflict with intended function or design, are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's representative in written, accurate detail. Pending receipt of directive from Owner's representative, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.3 SALVAGE MATERIALS

A. All equipment and materials desired by Owner shall be delivered to a designated location, not further than 2 miles from the job site. Desired equipment may include, but not be limited to, generator, pumps, motors, controls, valves, electrical panels, and other items.

Any articles of historic significance will remain the property of the Owner. Notify Owner's representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubbish and other materials resulting from demolition operations from site. Transport and legally dispose of materials off site.

If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project site.

3.5 CLEAN-UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave site clean.

Repair demolition performed in excess of required work. Return structures and surfaces to remain to the condition existing prior to commencement of selective

demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

Fill in all voids created by selective demolition and grade site to drain. Grass all disturbed areas for erosion control.

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02110-1

SECTION 02110

SITE CLEARING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of paving.
- C. Removal of trees, shrubs, and other plant life.
- D. Topsoil excavation.

1.2 RELATED SECTIONS

A. Section 02204 - Earthwork.

1.3 MEASUREMENT AND PAYMENT

A. Site Clearing: Clearing, grubbing and other items to be removed will be included in the lump sum price in the proposal for clearing work. Includes clearing site, removing stumps, loading and removing waste materials from site.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.1 **PREPARATION**

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify a waste area for placing removed materials.

3.2 **PROTECTION**

A. All trees on site will be saved except those marked specifically by the Owner's representative for removal during construction. No trees, including those marked for removal on site or any other tree, may be removed prior to the preconstruction conference. All trees not to be removed will be protected from injury to their roots and to their top to a distance three feet beyond the drip-line and no grading, trenching, pruning, or storage of materials may go in this area except as provided by an Owner's representative stakeout. Contractor will pay a penalty for any tree removed from the site that has not been marked specifically

for removal. Contractor also will pay for any tree that dies due to damage during construction. This applies to all trees on site whether or not they are shown on the plans.

B. Contractor shall not be held accountable for damages to trees resulting from placement of fill or removal of soils where such action is required by the contract documents. Any tree, the trunk of which is within 10 feet of any footing or trench, shall be exempt from these penalties except Contractor shall exercise all reasonable precautions to preserve even these trees. Contractor agrees to pay fines as established below in the event he or any of his subcontractors causes loss or removal of trees designated to be saved under provisions of this contract.

The fines are as follows:

<u>Caliper</u>	<u>Fine</u>	
1" - 2"	\$ 150.00	
2" - 3"	200.00	
3" - 4"	250.00	
4" - 5"	400.00	
5" - 6"	500.00	
6'' - 7''	600.00	
7" - 8"	750.00	
8" - 11"	1,500.00	
12" - 20"	2,000.00	
21" & larger	\$ 2,500.00	

- C. Trees shall be graded by Owner's representative as to variety, condition, and site importance, with above figures acting as a maximum fine. Lowest assessment amount shall be no less than one-half of the above fine figures.
- D. Protect bench marks, survey control points, and existing structures from damage or displacement.
- E. Protect all remaining utilities.
- F. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and to provide for the safety of employees and others.

3.3 CLEARING

A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be [burned or] removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1-1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the

tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an accepted treewound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the OWNER before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures obtruding, encroaching upon, or otherwise obstructing the work.

3.4 REMOVAL

- A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. Work shall include felling of such trees and removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.
- B. Remove debris, rock, and other extracted plant life from site.
- C. Partially remove paving as indicated on plans. Neatly saw cut edges at right angle to surface.

3.5 DISPOSAL

Disposal of trees, branches, snags, brush, stumps, etc., resulting from clearing and Α. grubbing shall be the Contractor's responsibility and shall be disposed of by burning, removal from site, or a combination of both. All costs in connection with disposing of materials will be at the Contractor's expense. Material disposed of by burning shall be burned in a manner avoiding all hazards, such as damage to existing structures, construction in progress, trees, and vegetation. Contractor shall be responsible for compliance with all local and State laws and regulations relative to the building of fires. Disposal by burning shall be kept under constant attendance until fires have burned out or extinguished. All liability of any nature resulting from disposal of cleared and grubbed material shall become the Contractor's responsibility. Disposal of all materials cleared and grubbed will be in accordance with rules and regulations of the State of South Carolina. No material will be burned unless directed to do so by the OWNER. Contractor shall obtain a permit to burn on site from local fire department, before beginning the work.

3.6 GRUBBING

A. Grubbing shall consist of removal and disposal of stumps, roots larger than one inch in diameter, and matted roots from designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of pavement subgrade or building pads, shall be excavated and removed to a depth of not less than 18 inches below original surface level of the ground in embankment areas and not less than 2 feet below finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform to original adjacent ground.

02111-1

SECTION 02111

SITE PREPARATION

Paragraph

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Protection or removal of trees and other vegetation.
 - 2. Topsoil stripping.
 - 3. Clearing and grubbing.
 - 4. Erosion control.

1.2 RELATED REQUIREMENTS

- A. Construction Drawings
- B. Section 02050 Demolition

1.3 **PROTECTIONS**

- A. Provide protection necessary to prevent damage to existing improvements, trees, or vegetation indicated on the Contract Documents to remain.
- B. Protect improvements on adjoining properties and on Owner's property.
- C. Restore damaged improvements to original condition as acceptable to parties having jurisdiction.
- D. Conduct operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction and from Owner. Streets and roadways shall be thoroughly cleaned and/or swept on a daily basis or more frequently as required by the governing authority.
- E. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform traffic Control Devices" and the state highway department requirements.
- F. Provide necessary erosion control measures to prevent siltation of existing pavement or storm drainage facilities to remain.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

A. Unless otherwise indicated on the drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction within the limits of work. Removal includes digging out stumps and

roots. Do not remove items elsewhere on site or premises unless specifically indicated.

- B. Strip topsoil to whatever depths encountered to prevent intermingling with underlying subsoil or other objectionable material. Cut heavy growths of grass from areas before stripping. Topsoil shall consist of sandy clay surficial soil found in depth of not less than 6 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, weeds, roots, and other objectionable material.
- C. Stockpile topsoil in storage piles in areas shown or where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust. Dispose of unsuitable or excess topsoil same as specified for waste material, unless otherwise specified by Owner.
- D. Completely remove stumps, roots, and other debris below proposed subgrade elevation. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is required. Place fill material in horizontal layers not exceeding 8-inches loose depth, and thoroughly compacted per fill requirements of this section.
- E. Remove existing above grade and below grade improvements and abandoned underground piping or conduit necessary to permit construction and other work.

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SECTION 02204 – EARTHWORK

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SECTION 02204

EARTHWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Grading
- B. Excavation
- C. Backfilling
- D. Compaction
- E. Remove and Replace Topsoil
- F. Dressing of Shoulders and Banks
- G. Stone Drainage Filter
- H. Water Control
- I. Testing

1.2 RELATED SECTIONS

- A. Section 01400 Quality Control
- B. Section 01410 Testing Services
- C. Section 02110 Site Clearing
- D. Section 01410 Testing Services
- E. Section 02111 Site Preparation

1.3 MEASUREMENT AND PAYMENT

- A. Grading to subgrades, construction of ditches, dressing of disturbed areas, removing and replacing topsoil, excavating, backfilling and compacting to required elevations, testing, staking, and construction supervision shall be included in the contract lump sum price for "Grading."
- B. Unsuitable Material Payment will be made on a contract unit price for each cubic yard removed. Payment will include excavation and disposal of unsuitable material.

- C. Borrow Payment will be made on a contract unit price for each cubic yard in place. Payment will include furnishing materials required in excess of suitable materials available on site.
- D. Earthwork All earthwork associated with the installation of bulkheads, headwalls, wingwalls, weir structures, drainage filters, rip-rap, etc. shall not be measured for direct payment. Payment for the earthwork shall be included in the item to which it pertains.
- E. Dewatering No direct payment shall be made for dewatering. Dewatering shall be included in the item to which it pertains.
- F. Proof Rolling Payment will be made at the contract unit price. Payment will include furnishing a loaded truck, truck driver, fuel and rolling the designated areas.

1.4 **REFERENCES (LATEST REVISION)**

- A. ASTM D 448 Sizes of Aggregate for Road and Bridge Construction.
- B. ASTM D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D 6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. ASTM D 3740 Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- F. ASTM E 329 Agencies Engaged in Construction Inspection and/or Testing.

1.5 SUBMITTALS

- A. Section 01300 Submittals: Procedures for submittals.
- B. Materials Source: Submit gradation analysis, proctor results, and soil classification for all borrow material.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with Federal, State of South Carolina, County of McCormick standards.

1.7 TESTING

A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).

- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any of the tests.
- E. Engineer shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
 - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Borrow shall consist of sand or sand-clay soils capable of being readily shaped and compacted to the required densities, and shall be reasonably free of roots, trash, rock larger than 2 inches, and other deleterious material.
- B. All soils used for structural fills shall have a PI (plastic index) of less than 10, and a LL (liquid limit) of less than 30. Fill soils shall be dried or wetted to appropriate moisture contents prior to compaction. Additionally, fill soils used for the top 2 feet of fill beneath roads and parking lots shall have no more than 15% passing the # 200 sieve. Fill soils used for house lots shall have no more than 25% passing the # 200 sieve.
- C. Contractor shall furnish all borrow material.
- D. Contractor shall be responsible for and bear all expenses in developing borrow sources including securing necessary permits, drying the material, haul roads, clearing, grubbing, excavating the pits, placing, compaction and restoration of pits and haul roads to a condition satisfactory to property owners and in compliance with applicable federal, state, and local laws and regulations.

2.2 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.
- B. Provide materials of each type from same source throughout the Work.

PART 3 – EXECUTION

3.1 TOPSOIL

- A. Contractor shall strip topsoil and stockpile on site at a location determined by the Owner at the Contractor's expense.
- B. Topsoil shall be placed to a depth of 4 inches over all disturbed or proposed landscaped areas.
- C. Topsoil shall be provided at Contractor's expense if it is not available from site.
- D. Any remaining topsoil will be hauled off site at the Contractors expense.
- E. Do not excavate wet topsoil.

3.2 EXCAVATION

- A. Suitable excavation material shall be transported to and placed in fill areas within limits of the work.
- B. Unsuitable material encountered in areas to be paved and under building pads, shall be excavated 2 feet below final grade and replaced with suitable material from site or borrow excavations. Contractor shall notify Engineer if more than 2 feet of excavation is needed to replace unsuitable material.
- C. Unsuitable and surplus excavation material not required for fill shall be disposed of off site.
- D. Proper drainage, including sediment and erosion control, shall be maintained at all times. Methods shall be in accordance with the National Pollutant Discharge Elimination System standards and other local, state, and federal regulations.
- E. Unsuitable materials as stated herein are defined as highly plastic clay soils, of the CH and MH designation, border line soils of the SC-CH description, and organic soils of the OL and OH description based on the Unified Soils Classification System. Further, any soils for the top two feet of pavement subbase shall have no more than 15% passing the # 200 sieve.

3.3 GROUND SURFACE PREPARATION FOR FILL

A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.

- B. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.
- C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.4 FILL

A. Shall be placed in successive horizontal layers 8 inches to 12 inches in loose depth for the full width of the cross-section and compacted as required.

3.5 FINISHED GRADING

- A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.
- B. Degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, supplemented with hand raking and finishing, except as otherwise specified.
- C. Unpaved areas to within 0.1 feet of elevations shown on the drawings provided such deviation does not create low spots that do not drain.
- D. Paved Areas Subgrade to within 0.05 feet of the drawing elevations less the compacted thickness of the base and paving.
- E. Ditches and lagoon banks shall be finished graded, dressed, and seeded within 14 calendar days of work to reduce erosion and permit adequate drainage.

3.6 DISPOSAL OF WASTE MATERIAL

A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable or surplus material stripped or removed from limits of construction shall be disposed of by the Contractor.

3.7 **PROTECTION**

- A. Graded areas shall be protected from traffic, erosion, settlement, or any washing away occurring from any cause prior to acceptance.
- B. Contractor shall be responsible for protection of below grade utilities shown on the drawings or indicated by the Owner at all times during earthwork operations.
- C. Repair or re-establishment of graded areas prior to final acceptance shall be at the Contractors expense.
- D. Site drainage shall be provided and maintained by Contractor during construction until final acceptance of the project. Drainage may be by
supplemental ditching, or pumping if necessary, prior to completion of permanent site drainage.

3.8 DRAINAGE

A. Contractor shall be responsible for providing surface drainage away from all construction areas. This shall include maintenance of any existing ditches or those constructed in the immediate vicinity of the work. Contractor shall provide proper and effective measures to prevent siltation of wetlands, streams, and ditches on both the Owner's property, and those properties downstream.

3.9 FIELD QUALITY CONTROL

- A. Compaction testing shall be performed in accordance with ASTM D 6938. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.
- B. Unpaved areas at least 90% of maximum laboratory density within 2% optimum moisture content unless otherwise approved by the Engineer.
- C. Paved Areas and Under Structures top 6 inch layer of subbase to at least 98% of maximum laboratory density within 2% optimum moisture content. Layers below top 6 inches shall be compacted to 95% of maximum laboratory density within 2% optimum moisture content.
- D. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.
- E. Number of Tests Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made.

3.10 PROOF ROLLING

A. Shall be required on the subbase of all curb and gutter and paved areas and on the base of all paved areas where designated by the Engineer. Proof rolling shall take place after all underground utilities are installed and backfilled. The operation shall consist of rolling the subbase or base with a fully loaded 10 wheeled dump truck. A full load shall consist of 10 to 12 cubic yards of soil or rock. The dump truck shall be capable of traveling at a speed of two to five miles per hour and be in sound mechanical shape with no exhaust leaks or smoking from burning oil. The Engineer shall determine number of passes and areas rolled.

SECTION 02210 - SOIL EROSION CONTROL

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Silt Fence

Rip-Rap

Dust Control Sediment Basin

Construction Exit

Inlet Protection

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SECTION 02210

SOIL EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section.

1.2 DESCRIPTION OF WORK

A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

Erosion and sediment control measures shall be installed prior to any construction activity.

Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

1.3 PURPOSES

- A. Contractor is to achieve the following goals:
 - 1. Minimize soil exposure by proper timing of grading and construction.
 - 2. Retain existing vegetation whenever feasible.
 - 3. Vegetate and mulch denuded areas as soon as possible.
 - 4. Divert runoff away from denuded areas.
 - 5. Minimize length and steepness of slopes when it is practical.
 - 6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
 - 7. Trap sediment on site.
 - 8. Inspect and maintain erosion control measures.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of soil erosion control systems products of types and sizes required, whose materials have been in satisfactory use for not less than 5 years.

B. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion control materials and products.

1.6 MEASUREMENT AND PAYMENT

A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal. The cost of soil erosion control shall include all equipment, labor and materials necessary to comply with the State of South Carolina [Georgia] [North Carolina] Erosion and Sediment Control Program.

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

- A. Refer to Section 02902 Grassing.
 - 1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.
 - 2. Type of Seed: Either Annual Rye or Common Bermuda Grass seed will be used depending on time of year in which seeding is to occur.
 - 3. Mulch: Straw.
 - 4. Fertilizer: Commercial balanced 4-12-12 fertilizer.

2.2 HAY BALES

A. Standard size, densely baled straw or hay, wrapped with synthetic or wire bands (two minimum per bale).

2.3 SILT FENCE

A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra-violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

Woven Fabrics	
Grab Strength	90 lbs.
Burst Strength	175 PSI
UV Resistance	80%

2.4 CHEMICALS FOR DUST CONTROL

A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

2.5 RIP-RAP

A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25 pounds to a maximum of 125 pounds. At least 50 percent of the stone shall weigh more than 60 pounds. The stone shall have a minimum dimension of 12 inches.

2.6 **PRODUCT REVIEW**

A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14 days of work ending unless work is to begin again before 21 days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

3.2 GRASSING

A. Refer to Section 02902 - Grassing.

3.3 SEDIMENT BARRIERS

- A. Hay Bales for Sheet Flow Applications:
 - 1. Excavate a 4 inch deep trench the width of a bale and length of proposed barrier. Barrier should be parallel to the slope. Place barrier 5 to 6 feet away from toe of slope, unless otherwise instructed.
 - 2. Place bales in the trench with their ends tightly abutting. Corner abutment is not acceptable. A tight fit is important to prevent sediment from escaping through spaces between the bales.

- 3. Backfill the trench with previously excavated soil and compact it. Backfill soil should conform to ground level on downhill side of barrier and should be built up to 4 inches above ground on uphill side of bales.
- 4. Inspect and repair or replace damaged bales promptly. Remove hay bales when uphill sloped areas have been permanently stabilized.
- B. Rock Ditch Check
 - 1. Excavate a 6 inch deep trench the width and length of proposed barrier. Install a non-woven geotextile fabric in the trench before placing rock for the ditch check.
 - 2. The body of the ditch check shall be constructed of 12 inch rip-rap. The upstream face may be covered with 1-inch washed stone.
 - 3. Ditch checks shall not exceed a height of 2 feet at centerline of the channel and have a minimum top flow length of 2 feet.
 - 4. Rip-rap shall be placed over the channel banks to prevent water from flowing around ditch check. Rock must be installed by hand or mechanical placement (no dumping of rock) to achieve complete coverage of the ditch and ensure the center of the check is lower than the edges.
 - 5. The maximum spacing between ditch checks shall be where the toe of the upstream check is at the same elevation as the top of the downstream check.
 - 6. Contractor shall maintain ditch checks as required by State regulations.

3.4 SILT FENCE

A. Silt fence shall be placed at approximate location shown and installed in accordance with the detail on the construction drawings. Contractor shall maintain silt fence as required by state regulations.

3.5 DUST CONTROL

- A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer's recommendations.
- B. Contractor shall use all means necessary to control dust on and near the work, or off-site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

3.6 SEDIMENT BASIN

A. A sediment basin equal in volume to 3,600 cubic feet per disturbed acre is required. The sediment basin/lagoon adjacent to the outfall for the site shall be constructed and stabilized prior to any additional land disturbed activity.

3.7 RIP-RAP

A. Rip-Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

3.8 CONSTRUCTION EXIT

A. Construct exit at the location shown per detail on the construction drawings. Contractor shall maintain construction exit as required by state regulations.

3.9 INLET PROTECTION

A. Install inlet protection per detail on the construction drawings. Contractor shall maintain inlet protection as required by state regulations until all disturbed surfaces are stabilized.

SECTION 02231 - AGGREGATE BASE COURSE

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SECTION 02231

AGGREGATE BASE COURSE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

1.2 **RELATED SECTIONS**

- A. Section 01025 Measurement and Payment: Requirements applicable to unit prices for the work of this section.
- B. Section 01400 Quality Control.
- C. Section 02204 Earthwork
- D. Section 02512 Asphaltic Concrete Binder/Surface Courses

1.3 MEASUREMENT AND PAYMENT

- A. Aggregate Base Course: Payment will be made at the contract unit price. Payment will include supplying all material, labor, and equipment, stockpiling, scarifying substrate surface, placing where required, and compacting.
- B. Prime Coat: Bituminous prime coat will not be measured for separate payment. All costs connected with applying prime coat will be included in the unit price bid for Aggregate Base Course.

1.4 **REFERENCES (LATEST REVISION)**

- A. ASTM C 131 Resistance to Degradation of Small-Size Course Aggregate by Abrasion and Impact in the Lost Angeles Machine.
- B. ASTM D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D 6938 In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- D. ASTM D 3740 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- E. ASTM E 329 Agencies Engaged in Construction Inspection and/or Testing.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with the <u>South Carolina Department of</u> <u>Transportation Standard Specifications for Highway Construction, Latest Edition</u>.

1.6 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- E. Engineer shall select and engage the Testing Laboratory. Testing Laboratory shall be responsible to the Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of Testing Laboratory when:
 - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. Testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aggregate shall consist of processed and blended crushed stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. Coarse aggregate shall have a percentage of wear not to exceed 65% after 500 revolutions as determined by ASTM C 131. Aggregate shall meet applicable requirements of Section 305.2 in the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition. Material shall meet the following gradation and other requirements:

Granite Stone or Recycled Concrete		
Sieve Size Percent by Weight Passing		
2" 100		

1-1/2"	95 - 100
ן יי	70 - 100
1/2"	48 - 75
# 4	30 - 60
# 30	11 - 30
#200	0 - 12
Liquid Limit	0 to 25
Plasticity Index	0 to 6

Marine Limestone		
Sieve Size	Percent by Weight Passing	
2"	100	
1-1/2"	95 - 100	
ן יי	70 - 100	
1/2"	50 - 85	
# 4	30 - 60	
# 30	17 - 38	
#200	0 - 20	
Liquid Limit	0 to 25	
Plasticity Index	0 to 6	

B. Prime Coat: Shall be EA-P Special, Emulsified asphalt, conforming to Section 407 of the <u>South Carolina Department of Transportation Standard Specifications for</u> <u>Highway Construction, Latest Edition</u>.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify subbase has been tested, is dry, and slopes and elevations are correct.
- B. ON SITE OBSERVATIONS OF WORK: The Owner's Representative or Engineer will have the right to require any portion of the work be completed in their presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to the Owner. However, if the Contractor notifies the Owner such work is scheduled, and the Owner fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Owner, Engineer or Project Representative. Improper work shall be reconstructed, and all materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

3.2 PREPARATION

- A. Subbase shall be graded and shaped conforming to the lines, grades, and cross sections required and cleaned of all foreign substances prior to constructing base course. Do not place base on soft, muddy or frozen surfaces. Correct irregularities in subbase slope and elevation by scarifying, reshaping, and recompacting.
- B. At the time of base course construction, subbase shall contain no frozen material.
- C. Surface of subbase shall be checked by the Engineer or Project Representative for adequate compaction and surface tolerances. Ruts or soft yielding spots appearing in areas of subbase course having inadequate compaction, and areas not smooth or which vary in elevation more than 3/8 inch above or below required grade established on the plans, shall be corrected to the satisfaction of the Engineer or Project Representative. Base material shall not be placed until subbase has been properly prepared and test results have so indicated.

3.3 AGGREGATE PLACEMENT

- A. Aggregate shall be placed in accordance with <u>South Carolina Department of</u> <u>Transportation Standard Specifications for Highway Construction, Latest Edition</u> Section 305 and in accordance with all terms included in these specifications.
- B. Level and contour surfaces to elevations and slopes indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- F. While at optimum moisture (\pm 1-1/2%), compact base course with rollers capable of obtaining required density. Vibratory, flatwheel, and other rollers accepted by the Engineer may be used to obtain required compaction. Rolling shall continue until base is compacted to 98% of the maximum laboratory dry density as determined by ASTM D 1557. In-place density of the compacted base will be determined in accordance with ASTM D 6938.

3.4 PRIME COAT

A. Bituminous material for the prime coat shall be applied uniformly and accurately in quantities of not less than 0.15 gallons per square yard nor more than 0.30 gallons per square yard of base course. All irregularities in the base course surface shall be corrected prior to application of prime coat. Clean the base course of all mud, dirt, dust, and caked and loose material

- B. Do not apply prime to a wet surface nor when temperature is below 40°F in the shade. Do not apply prime when rain threatens nor when weather conditions prevent proper construction and curing of prime coat.
- C. The primed base should be adequately cured before the binder or surface course is laid. In general, a minimum of 48 hours should be allowed for complete curing. Ordinarily, proper surface condition of the prime is indicated by a slight change in the shiny black appearance to a slightly brown color.

3.5 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with an acceptable 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 3/8 inch.
- C. Variation from Design Elevation: Within 3/8 inch.
- D. Depth measurements for compacted thickness shall be made by test holes through the base course. Where base course is deficient, correct such areas by scarifying, adding base material and recompacting as directed by the Engineer.

3.6 FIELD QUALITY CONTROL

- A. Section 01400 Quality Assurance: Field inspection.
- B. Density and moisture testing will be performed in accordance with ASTM D 1557 and ASTM D 6938.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- D. Frequency of Tests:
 - 1. Base Density and Thickness One test per 5,000 square feet.

SECTION 02275 - RIP-RAP

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SECTION 02275

RIP-RAP

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Material placed as bank protection and erosion control.

1.2 **RELATED SECTIONS**

- A. Section 02204 Earthwork
- B. Section 02210 Soil Erosion Control
- C. Section 02720 Storm Drainage

1.3 ALLOWABLE TOLERANCES

A. Depth of rip-rap blanket as shown on the drawings and in these specifications is a minimum depth.

1.4 MEASUREMENT AND PAYMENT

A. Rip-Rap: Payment will be made at the contract unit price. Payment will include furnishing all labor, materials, and equipment and placing on a prepared surface.

1.5 REFERENCES (LATEST REVISION)

A. ASTM C 150 – Portland Cement.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Stone Rip-Rap: Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight or weather. Stone shall be solid and non-friable and range in weight from a minimum of 25 pounds to a maximum of 150 pounds. At least 50 percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12 inches. Documents indicating stone analysis, source and other pertinent data (i.e. filter fabric) shall be submitted for review by the Engineer prior to delivery.
- B. Sand-Cement Bag Rip-Rap:
 - 1. Bags: Shall be of cotton, burlap, or fiber-reinforced paper capable of containing the sand-cement mixture without leakage during handling and placing. Bags previously used for any purpose shall not be used.

Capacity shall be not less than 0.75 cubic foot nor more than two cubic feet.

- 2. Cement: Portland cement shall be Type I meeting requirements of ASTM C 150. Cement which has been damaged, or which is partially set, lumpy, or caked shall not be used.
- 3. Fine Aggregate: Shall be composed of hard, durable particles, free from injurious amounts of organic impurities and shall contain, in the material passing the No. 10 sieve, not more than 7 percent clay, and not more than 20 percent passing the No. 200 sieve.
- C. Filter Fabric: Shall be a woven fabric of monofilament and multifilament yarn equivalent to Mirafi FW700. Fabric shall be finished so the filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. Fabric shall be free of flaws, rips, holes or defects.

2.2 PRODUCT REVIEW

A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 PREPARATION

A. The surface to receive rip-rap shall be prepared to a relatively smooth condition free of obstruction, depressions, debris, rises, and soft or low density pockets of material. Contours and elevations on construction drawings are to the surface of rip-rap material.

3.2 PLACEMENT

- A. Filter fabric shall be placed with the long dimension running up slope. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. Fabric shall be anchored in place with securing pins of the type recommended by fabric manufacturer. Pins shall be placed on or within 3 inches of the over-lap. Place fabric so upstream strip will overlap the downstream strip. Fabric shall be placed loosely to give and avoid stretching and tearing during placement of the stones.
- B. Minimum depth or thickness of stone blanket shall be 12 inches with no under tolerance. Stones shall be dropped no more than three feet during construction. Placing shall begin at bottom of slope. Provide a toe trench if required as detailed on the construction drawings. Entire mass of stone shall be placed to conform with lines, grades, and thickness shown on the plans. Rip-rap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of rip-rap in layers, or by dumping into chutes, or by similar methods likely to cause segregation, will not be permitted.

Larger stones shall be well distributed and the entire mass of stone shall conform to gradation specified. All material used in rip-rap protection shall be placed and distributed so there will be no large accumulations of either the larger or smaller sizes of stone.

It is the intent of these specifications to produce a fairly compact rip-rap protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to secure the results specified.

C. Sand-Cement Bag Rip-Rap: Bags shall be uniformly filled. Bagged rip-rap shall be placed by hand with tied ends facing the same direction, with close, broken joints. After placing, bags shall be rammed or packed against one another to produce the required thickness and form a consolidated mass. The top of each bag shall not vary more than 3 inches above or below required plane. When directed by the Engineer or required by construction drawings, header courses shall be placed.

SECTION 02512SC – ASPHALTIC CONCRETE BINDER/SURFACE COURSES

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SECTION 02512SC

ASPHALTIC CONCRETE BINDER/SURFACE COURSES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Surface Course
- B. Binder Course

1.2 **RELATED SECTIONS**

- A. Section 01025 Measurement and Payment
- B. Section 01400 Quality Control
- C. Section 02204 Earthwork
- D. Section 02231 Aggregate Base Course

1.3 MEASUREMENT AND PAYMENT

- A. Asphaltic Concrete Binder Course: Will be paid for at the contract unit price per square yard of completed and accepted binder course for the thickness specified.
- B. Asphaltic Concrete Surface Course: Will be paid for at the contract unit price per square yard of completed and accepted surface course for the thickness specified.
- C. Tack Coat: Will be paid for at the contract unit price per square yard of base or pavement covered.
- D. Payment for pavement and tack coat will be in full for preparing and cleaning, providing all materials, labor and equipment including placing, compacting and testing.

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 946 Penetration-Graded Asphalt-Cement for Use in Pavement Construction.
- B. ASTM E 329 Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 3740 Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.

- D. ASTM D 2726 Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- E. ASTM D 2950 Density of Bituminous Concrete in Place by Nuclear Methods.
- F. ASTM D 1188 Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
- G. ASTM D 1754 Effect of Heat and Air on Asphaltic Materials (Thin-film Oven Test).

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.
- B. Mixing Plant: Conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do <u>not</u> place asphalt mixture when ambient air temperature is less than that indicated in the Table nor when the surface is wet or frozen.

Lift Thickness	Min. Air Temperature, Degrees F.
1" or Less	55
1.1" to 2"	45
2.1" to 3"	40
3.1" to 4.5"	35

B. Mixture shall be delivered to the spreader at a temperature between 250 degrees F and 325 degrees F.

1.7 GUARANTEE

A. Contractor shall guarantee the quality of materials, equipment, and workmanship for a period of 12 months after acceptance. Defects discovered during this period shall be repaired by the Contractor at no cost to the Owner.

1.8 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.

- C. Engineer shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
 - 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 TACK COAT

A. Shall consist of asphalt binder (asphalt cement) or emulsified asphalt, conforming to Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition. Asphalt binder shall be PG64-22. The acceptable grades of emulsified asphalt are RS-1, MS-1, MS-2, HFMS-1, HFMS-2, SS-1, CRS-1, CRS-2, CMS-2, and CSS-1.

2.2 ASPHALT BINDER AND ADDITIVES

- A. Shall be PG64-22 and conform to Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.
- B. Anti-Stripping: Shall conform to requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.

2.3 AGGREGATES

A. General: Mineral aggregate shall be composed of fine aggregate or a combination of fine and coarse aggregate. Coarse aggregate shall be that portion of the material retained on a No. 4 sieve.

Fine aggregate shall be considered that portion passing the No. 4 sieve. Fine aggregate, coarse aggregate, and any additives in combination with the specified percentage of asphalt cement shall meet the requirements of tests specified, before acceptance may be given for their individual use. Marine (Fossiliferous) limestone shall not be used.

- B. Fine Aggregate: Shall conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction.
- C. Coarse Aggregate: Shall be granite stone and conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.
- D. Surface Course: The surface course shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt binder in an acceptable mixing plant. The plant shall conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition. The gradations, asphalt content and air voids shall be the following:

TYPE C		
Square Sieve	% Passing	
3/4 inch	100	
1/2 inch	97 – 100	
3/8 inch	83 – 100	
No. 4	58 – 80	
No. 8	42 - 62	
No. 30	20 - 40	
No. 100	8 – 20	
No. 200	3 – 9	
% Asphalt Binder	5.0 - 6.8	
Air Voids, %	3.5 - 4.5	

E. Intermediate or Binder Course: The mineral aggregates and asphalt binder shall be combined in such proportions the composition by weight of the finished mixture shall be within the following range limits:

ТҮРЕ В		
Sieve Designation	Percentage by Weight Passing	
1 inch	100	
3/4 inch	90 - 100	
1/2 inch	75 – 90	
3/8 inch	64 - 80	
No. 4	38 – 54	
No. 8	22 - 36	
No. 30	8 – 22	
No. 100	3 – 10	
No. 200	2-8	
% Asphalt Binder	4 - 6	
Air Voids, %	3.5 – 4.5	

2.4 SOURCE QUALITY CONTROL AND TESTS

- A. Section 01400 Quality Control and Section 01410 Testing Laboratory Services.
- B. Submit proposed mix design for review prior to beginning of work.
- C. Test samples in accordance with the requirements of these specifications.

PART 3 – EXECUTION

3.1 EXAMINATION

A. On-Site Observations: Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence. If work is covered up after such instruction, it shall be exposed by the Contractor for observation at no additional cost to Owner. However, if Contractor notifies Engineer such work is scheduled, and Engineer fails to appear within 48 hours, the Contractor may proceed. All work completed and materials furnished shall be subject to review by the Engineer or Project Representative. Improper work shall be reconstructed. All materials, which do not conform to requirements of specifications, shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Owner, Project Engineer or Project Representative a minimum of 48 hours notice for all required observations or tests.

B. Contractor shall verify base has been tested, is dry, and slopes and elevations are correct.

3.2 PREPARATION

- A. Apply tack coat in accordance with Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition. Rate of application shall be 0.05 to 0.15 gallons per square yard of surface.
- B. Work shall be planned so no more tack coat than is necessary for the day's operation is placed on the surface. All traffic not essential to the work should be kept off the tack coat.
- C. Apply tack coat to contact surfaces of curbs and gutters. Apply in manner so exposed curb or gutter surfaces are not stained.
- D. Coat surfaces of manhole frames and inlet frames with oil to prevent bond with asphalt pavement. Do <u>not</u> tack coat these surfaces

3.3 PLACEMENT

- A. Construction shall be in accordance with Sections 401, 402, and 403 of the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.
- B. Asphaltic concrete shall not be placed on a wet or frozen surface.
- C. Compaction shall commence as soon as possible after the mixture has been spread to the desired thickness. Compaction shall be continuous and uniform over the entire surface. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Compaction rolling shall be complete before material temperature drops below 175° F.
- D. Areas of pavement with deficient thickness or density shall be removed and replaced at no additional cost to the Owner.

3.4 TOLERANCES

- A. General: All paving shall be subject to visual and straightedge evaluation during construction operations and thereafter prior to final acceptance. A 10-foot straightedge shall be maintained in the vicinity of the paving operation at all times for the purpose of measuring surface irregularities on all paving courses. The straightedge and labor for its use shall be provided by the Contractor. The surface of all courses shall be checked with the straightedge as necessary to detect surface irregularities. Irregularities such as rippling, tearing or pulling, which in the judgment of the Engineer indicate a continuing problem in equipment, mixture or operating technique, will not be permitted to recur. The paving operation shall be stopped until appropriate steps are taken by the Contractor to correct the problem.
- B. Flatness: All irregularities in excess of 1/8 inch in 10 feet for surface courses and 1/4 inch in 10 feet for intermediate courses shall be corrected.
- C. Variation from Design Elevation:
 - 1. General Paving: Less than 1/4 inch.
 - 2. Accessible Routes: Shall not exceed 1/4 inch. However, accessible routes shall not exceed maximum ADA allowable slopes. Contractor shall remove and replace any and all portions of the accessible route that exceed maximum ADA allowable slopes.
- D. Scheduled Compacted Thickness: Within 1/4 inch per lift.
- E. Pavement Deficient in Thickness: When measurement of any core indicates the pavement is deficient in thickness, additional cores will be drilled 10 feet either side of the deficient core along the centerline of the

lane until the cores indicate the thickness conforms to the above specified requirements. A core indicating thickness deficiencies is considered a failed test. Pavement deficient in thickness shall be removed and replaced with the appropriate thickness of materials. If the Contractor believes the cores and measurements taken are not sufficient to indicate fairly the actual thickness of the pavement, additional cores and measurements will be taken, provided the Contractor will bear the extra cost of drilling the cores and filling the holes in the roadway as directed.

3.5 FIELD QUALITY CONTROL

- A. Acceptance of the in-place density of the binder and surface courses shall be in accordance with the South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition.
- B. Density Testing: Performed in accordance with ASTM D-2726 and ASTM D-2950. Core samples for each day's operation shall be taken, tested and results reported to the Engineer the following day. The areas sampled shall be properly restored by the Contractor at no additional cost to the Owner. Nuclear gauge tests shall be taken during the asphaltic concrete placement.
 - 1. The pavement core and nuclear gauge densities shall range between 94% and 96% of the theoretical maximum density.
- C. Temperature:
 - 1. Asphaltic concrete shall not exceed 325 degrees F at any time.
 - 2. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250 degrees F or the delivered temperature is more than 15 degrees F below the batch plant's delivery ticket.
 - 3. Temperature at time of loading shall be recorded on the truck delivery ticket.
- D. Frequency of Tests:
 - 1. Asphaltic Concrete One test for each 250 tons placed.
 - a. Asphalt extraction and gradation test.
 - b. Core Sample
 - 2. Field determination of density by nuclear method every 5,000 square feet during construction of the asphaltic concrete binder/surface course.

SECTION 02560 – FLOWABLE FILL

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SECTION 02560

FLOWABLE FILL

PART 1 – GENERAL

1.1 SCOPE

A. The work covered by this section consists of furnishing all material, equipment, and performing all labor for the manufacturing, transporting, and placing of flowable fill. The material shall be placed as shown on the contract drawings.

1.2 **RELATED SECTIONS**

A. Section 02512SC – Asphaltic Concrete Binder/Surface Course

1.3 REFERENCES (LATEST REVISION)

- A. ASTM C 33 Concrete Aggregates
- B. ASTM C 94 Ready-Mixed Concrete
- C. ASTM C 150 Portland Cement
- D. ASTM C 618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

1.4 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for grout. The cost will be included in the contract unit price for the Snap-Tite Pipes.
- B. For flowable fill, reference Section 210 "Flowable Fill" of the South Carolina Standard Specifications for Highway Construction, Latest Edition.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General Flowable fill shall be composed of fine aggregate (sand), cementitious materials (Portland cement plus fly ash), and water.
- B. Fine Aggregate Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33 for fine aggregate.
- C. Portland cement Portland cement shall conform to the requirements of ASTM C 150, Type I.
- D. Fly Ash Fly ash shall conform to the requirements of ASTM C 618, Class F.
- E. Mixing Water Mixing water shall conform to the requirements of ASTM C 94.

2.2 **PROPORTIONING**

A. The intended proportioning of materials for flowable fill per cubic yard shall be as follows:

Portland Cement	100 pounds
Fly Ash	300 pounds
Fine Aggregate (SSD)*	2,600 pounds
Water	584 pounds (70 gallons)

*Saturated Surface Dry

The amount of water may be adjusted to provide for a workable mix during placement.

The Contractor may direct minor modification of the mix proportioning to suit local conditions and materials.

PART 3 – EXECUTION

3.1 PLACEMENT

A. The flowable fill may be placed by direct discharge from the truck, by pumping or by other approved methods. It shall be placed as shown on the contract drawings.

CAUTION: Fluidized flowable fill is a heavy material and during placement (prior to seating) will exert a high fluid pressure against the pipe and any forms or wall used to contain the fill. Unless the pipe is anchored down or held in place in some manner, the placement of the flowable fill will cause the pipe to float or shift. The Contractor shall be responsible for anchoring or securing the pipe so the line and grade is maintained during placement and setting of the flowable fill.

To avoid displacing the pipe, placements have been made by placing the flowable fill in small incremental depths with the time interval between placements sufficient in length to allow initial "setting" of the prior placement. However, the Engineer in no way endorses or recommends this method. Should this method be utilized, the Contractor shall be responsible for developing a procedure that will ensure maintenance during placement and setting.

The ends of the flowable fill will require blocking with wood or metal forms, bags of soil, or other suitable means.

The flowable fill will tend to bleed water to the surface. The blocking of the ends of the flowable fill shall be accomplished in such manner so as not to prevent the runoff of the bleeding water.

Placement of flowable fill shall start only when weather conditions are favorable. The temperature shall be at least 35° F and rising. Mixing and placing shall stop when the temperature is 38° F and falling. Placement shall be performed when it is not raining, and shall be as continuous an operation as is practicable. The completed flowable fill shall not be subjected to any load and shall remain undisturbed by construction activities for at least 24 hours after placement.

Cover trenches as necessary with accepted material by Engineer.

SECTION 02570 - TRAFFIC CONTROL

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SECTION 02570

TRAFFIC CONTROL

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section covers furnishing, installation, and maintenance of all traffic control devices, portable signal equipment, warning signs, and temporary traffic lanes used during construction of the project.

1.2 RELATED WORK

N/A

1.3 **RESPONSIBILITY**

A. The Contractor shall furnish, install, and maintain all necessary automated signals, barricades, concrete traffic barriers, warning signs, traffic barriers, traffic lanes, and other protective devices. Ownership of these temporary warning devices shall remain with the Contractor provided devices are removed promptly after completion and acceptance of work to which devices pertain. If such warning devices are left in place for more than 30 days after specified time for removal, Owner shall have the right to remove such devices and to claim possession thereof.

1.4 MEASUREMENT AND PAYMENT

A. There will be no measurement for this item. Payment will be included in the contract unit price for "Traffic Control.".

PART 2 – PRODUCTS

2.1 MATERIALS

- A. All barricade signs, and traffic control signal devices shall conform to requirements of the current South Carolina Manual on Uniform Traffic Control Devices except as may be modified in these project specifications.
- B. Portable traffic control signal devices, barricades, signs and other Control Devices shall be either new or in acceptable condition when first erected on Project and shall remain in acceptable condition throughout the construction period.
- B. All signs shall have a black legend and border on an orange reflectorized background and will be a minimum of engineering grade reflective.

PART 3 – EXECUTION

3.1 ERECTION

A. Prior to commencement of any actual construction on the project, Contractor shall

erect appropriate advance warning signs and place concrete traffic barriers where necessary. Subsequently, as construction progresses and shifts from one side of road to the other, temporary lanes must be installed to provide continuous two way traffic and bike thoroughfare. All appropriate signs and traffic control devices pertinent to the work shall be erected ahead of construction site to advise and warn travelling public of activity and any necessary detours.

3.2 DELAYS TO TRAFFIC

- A. Except in rare and unusual circumstances, two-way traffic shall be maintained at all times by temporary and/or permanent roads. There are to be no traffic delays during the hours between 7 AM 10 AM and 4 PM 10 PM. Between the hours of 10 AM and 4 PM the maximum delay is to be 15-minutes.
- B. When traffic is halted temporarily due to transition procedures including the ingress and egress of construction vehicles, Contractor shall provide necessary flagging personnel with proper equipment and clothing to hold such traffic.
- C. If Contractor's proposed traffic control plan involves more than occasional disruption to alternating one way traffic through the work, then temporary, signalized control equipment will be required.

3.3 TEMPORARY TRAFFIC LANES

- A. One-lane traffic shall be maintained at all times unless prior written permission has been given and all necessary flagging personnel and/or signage has been installed. Temporary lane line stripes shall be applied to the detour paving, as agreed to by Engineer and Owner's representative. The no-passing double center-line stripes shall be yellow. Such stripes shall be a temporary, degradable, reflectorized tape strip. All temporary striping shall be maintained throughout the period traffic control is needed.
- B. Contractor is responsible for installation and removal of all temporary roads and trails throughout the construction process. These detour roads are to be in accordance with the Pavement Specifications herein.

3.4 SIGNS AND BARRICADES

- A. Contractor shall provide a detailed map showing location and verbage of all traffic control signs and methods for the project. All critical warning signs for the project will be a minimum of engineering grade reflective material and include appropriate flashing lights.
- B. Appropriate Safety Barricades shall be installed between bicycle trails, sidewalks, and the temporary traffic lanes. These barricades shall be impact resistant for passenger vehicles with a travelling speed of 40 mph.
 - 1. Advance warning signs: These signs shall be placed approximately 500 feet in advance of the construction site and detour on each approach to the construction area with subsequent warning signs every 250 feet, until construction site is met.

2. Barriers: Shall be wooden having a minimum of 3 horizontal 6 inch rails spaced 20 inches on center. Markings for barrier rails shall be 6 inches wide alternate orange and white reflectorized stripes sloping downward at 45 degrees in the direction traffic is to pass.

During hours of darkness, the Contractor shall place and maintain flashing warning lights on tops of all barriers.

3. End Construction Sign: This sign shall be 60 inches x 24 inches and erected approximately 200 feet beyond end of construction area on the right-hand side.

SECTION 02575 – SURFACE RESTORATION

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SECTION 02575

SURFACE RESTORATION

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. This section covers the work necessary to replace all pavements, rock surfacing, drainage facilities, and other features damaged either directly or indirectly by operations incidental to new construction. The work consists of restoring existing surface areas due to planned improvements.
- B. Standard specifications noted in this section are the South Carolina Department of Transportation (SCDOT) Standard Specifications for Highway Construction, Latest Edition.
- C. All disturbed areas shall be left equal to or better than preconstruction conditions.

1.2 MEASUREMENT AND PAYMENT

A. No separate measurement or payment shall be made. Applicable costs shall be included elsewhere.

1.3 GENERAL PROVISIONS

A. Maintenance of Traffic

Whenever work interferes with flow of traffic along a roadway, Contractor shall provide for traffic control, signing, and public safety in accordance with provisions of the State Department of Transportation and Manual on Uniform Traffic Control Devices. Neither road closures nor detours shall be permitted unless specified in the Special Provisions and applicable permits/approvals are authorized by Engineer and DOT. Where road closures or detours are permitted by Engineer and DOT, Contractor must notify the appropriate agencies or departments prior to taking action. Proper advance notice shall be provided to the Owner, Engineer, and DOT.

Compliance with this requirement shall not be construed to relieve Contractor from the responsibility of notifying agencies or institutions whose services may be predicated upon a roadway being opened to traffic or whose services would be hindered if a roadway is closed to traffic or delays traffic. Such agencies or institutions shall include, but not be limited to, police department, fire department, municipal bus service, school bus service, and ambulance service. Contractor shall keep the required agencies informed of changing traffic patterns and detour situations.

B. Surface Restoration

Contractor shall perform all work and furnish all materials to restore the work area. This includes any gravel, asphalt, concrete, lawn, fences, mailboxes, signs or any other surfaces or related objects damaged or disturbed by the construction operation. Surface restoration shall follow as closely as possible the backfill and compaction of excavations.

Cleanup shall be a continuing process from the start of work to final acceptance of project. Contractor shall, at all times, keep the area on which work is in progress free from accumulations of waste material or rubbish.

Spillage from the Contractor's hauling vehicles on public and private roads shall be promptly cleaned up. Upon completion of work, Contractor shall remove all temporary structures, rubbish, waste material, equipment, and supplies, resulting from the Contractor's operations. Contractor shall leave such lands in a neat and orderly condition, which is at least as good as found, prior to the new work. Contractor shall submit photos and similar records of preconstruction conditions to the Engineer prior to commencing work.

In roadways and traffic areas, Contractor shall be responsible for maintaining a road surface suitable for travel by the public and emergency vehicles from time of excavation until road surface has been restored. Such work includes dust control, temporary patching, signing, grading, temporary surfaces, and filling of potholes on temporary street surfaces, etc. Contractor shall be responsible for all claims and damages resulting from failure to maintain a suitable surface.

PART 2 – PRODUCTS

2.1 BASE COURSE

A. Aggregate shall consist of processed and blended crushed stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. Coarse aggregate shall have a percentage of wear not to exceed 65% after 500 revolutions as determined by ASTM C 131. Aggregate shall meet applicable requirements of Section 305.2 in the <u>South Carolina Department of Transportation</u> <u>Standard Specifications for Highway Construction, Latest Edition</u>. Material shall meet the following gradation and other requirements:

Granite Stone or Recycled Concrete	
Sieve Size	Percent by Weight Passing
2"	100
1-1/2"	95 - 100
]"	70 - 100
1/2"	48 - 75
# 4	30 - 60
# 30	11 - 30
#200	0 - 12
Liquid Limit	0 to 25
Plasticity Index	0 to 6

Marine Limestone		
Sieve Size	Percent by Weight Passing	
2"	100	
1-1/2"	95 - 100	
------------------	----------	
ן "	70 - 100	
1/2"	50 - 85	
# 4	30 - 60	
# 30	17 - 38	
#200	0 - 20	
Liquid Limit	0 to 25	
Plasticity Index	0 to 6	

B. Prime Coat: Shall be EA-P Special, Emulsified asphalt, conforming to Section 407 of the <u>South Carolina Department of Transportation Standard Specifications for</u> <u>Highway Construction, Latest Edition</u>.

2.2 ASPHALT CONCRETE

A. Surface Course: The surface course shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt binder in an acceptable mixing plant. The plant shall conform to South Carolina Department of Transportation Standard Specifications for Highway Construction, Latest Edition. The gradations, asphalt content and air voids shall be the following:

TYPE C			
Square Sieve	% Passing		
3/4 inch	100		
1/2 inch	97 – 100		
3/8 inch	83 – 100		
No. 4	58 – 80		
No. 8	42 - 62		
No. 30	20 - 40		
No. 100	8 – 20		
No. 200	3 – 9		
% Asphalt Binder	5.0 - 6.8		
Air Voids, %	3.5 – 4.5		

2.3 CONCRETE

Concrete for curbs, sidewalks, pavement, and miscellaneous construction shall conform to ASTM C 94, Alternate 3; and shall have a design mix proportioned for 3,000 pounds per square inch compressive strength at 28 days. Concrete mix shall contain no less than 5-1/2 sacks of cement per cubic yard.

- 1. Concrete Forms: All forms shall be either two-inch (2") dimension lumber, plywood, or metal forms.
- 2. Curing Compound: Commercial grade conforming to ASTM C 309, Type I.
- 3. Reinforcing Steel: Conform to ASTM A 615, Grade 60.

2.4 CONCRETE PIPE FOR CULVERT REPLACEMENT

Concrete Pipe shall conform to ASTM C 76, Class III O-ring unless there is less than 1.5 feet of cover over the pipe, then Class IV O-ring will be required.

PART 3 – EXECUTION

3.1 CONSTRUCTION PROCEDURE

- A. Engineer reserves the right to vary classes of backfill and type of resurfacing as best serves the interest of Owner. Trench backfill shall be as specified in the details and related specifications.
- B. Replace all pavement damaged under this contract with similar materials and design. Bomanite shall be replaced to match existing conditions.

3.2 REMOVAL OF PAVEMENT, SIDEWALK, CURBS AND GUTTERS

Removal and disposal of all pavement shall conform to the standard specifications. Saw cut sections to be removed to create a neat edge.

3.3 STREET MAINTENANCE

Maintain all streets as specified in the applicable Encroachment Permit(s) and allow traffic to follow normal or rerouted traffic patterns.

3.4 ASPHALT CONCRETE PAVEMENT REPLACEMENT

Procedures shall be followed as specified below and as detailed on the plans.

- A. Subgrade:
 - 1. Bring trench to a smooth, even grade at correct distance below top of existing pavement surface, providing adequate space for the base course and pavement. Trim existing pavement to a straight line. Remove any pavement which has been damaged, broken, or is unsound. Provide a smooth, sound edge for joining the new pavement.
 - 2. Compact the subgrade to ninety-seven percent (97%) of its modified proctor. (ASTM D-1557)
- B. Base Course:
 - 1. Place sufficient base course on the subgrade to obtain a minimum thickness of twelve inches (12") after compaction. Place for
 - 2. full width of the trench and compact as required to provide a smooth surface without segregation.
 - 2. Compact the base course with mechanical vibratory or impact tampers. Determine the amount and method of compaction necessary to prevent subsequent settlement. Any subsequent settlement of finished surfacing

during the warranty period shall be promptly repaired at Contractor's expense.

- C. Prime Coat: After base course has been compacted, apply an asphalt prime coat, specified above, at 0.15- to 0.30- gallon per square yard to the surface of base course and edges of existing pavement as required.
- D. Asphalt Concrete:
 - 1. Place asphalt concrete on prepared subgrade over the trench to a depth of not less than two and one-half inches (2 1/2") or depth of adjacent pavement, whichever is greater, but not for more than 6 inches. Place asphalt concrete after the prime coat has set. Spread and level asphalt concrete with hand tools or by use of a mechanical spreader, depending upon the area to be paved. Bring asphalt concrete to the proper grade and compact by rolling or use hand tampers where rolling is impossible or impractical.
 - 2. Roll with power rollers capable of providing compression of 200 to 300 pounds per linear inch. Begin rolling from outside edge of the replacement progressing toward existing surfacing, lapping existing surface at least one-half the width of the roller. If existing surfacing bounds both edges of the replacement, begin rolling at edges of the replacement, lapping existing surface at least one-half the width of the roller area. Overlap each preceding track by at least one-half the width of the roller and make sufficient passes over entire area to remove all roller marks and to produce desired result, as determined by Engineer.
 - 3. Finished surface of new compacted paving shall be flush with existing surface and shall conform to the grade and crown of adjacent pavement.
 - 4. Immediately after new paving is compacted, all joints between new and original asphalt pavement shall be painted with hot asphalt or asphalt emulsion and be covered with dry paving sand before the asphalt solidifies.
- E. Surface Smoothness: When a straightedge is laid across patched area between edges of old surfacing and surface of new pavement, new pavement shall not deviate from the straightedge more than one-quarter inch.

3.5 WEATHER CONDITIONS

Asphalt shall not be applied to wet material. Asphalt shall not be applied during rainfall, sand or dust storms, or any imminent storms. The Engineer will determine when surfaces and material are dry enough to proceed with construction. Asphalt concrete shall not be placed (1) when atmospheric temperature is lower than 45 degrees F (unless asphalt thickness is 1 inch, then temperature shall be above 55 degrees F), (2) during heavy rainfall, or (3) when the surface upon which it is to be placed is frozen or wet. Asphalt mixture shall be delivered to spreader at a temperature between 275 degrees F and 325 degrees F and shall not have dropped more than 50 degrees F from temperature the mix left asphalt

plant. Asphalt for prime coat shall not be applied when the surface temperature is less than 50 degrees F. Exceptions will be permitted only in special cases and only with prior written acceptance of the Engineer.

3.6 **PROTECTION OF STRUCTURES**

- A. Provide whatever protective coverings may be necessary to protect the exposed portions of bridges, culverts, curbs, gutters, posts, guard fences, road signs, and any other structures from splashing oil and asphalt from paving operations. Remove any oil, asphalt, dirt, or other undesirable matter from structures caused by the paving operations.
- B. Where water valve boxes, manholes, catch basins, or other underground utility appurtenances are within area to be surfaced, resurfacing shall be level with the top of existing finished elevation of these facilities. If it is evident these facilities are not in accordance with the proposed finished surface, notify Engineer to have proper authority contacted. Have the facility altered before proceeding with resurfacing around the obstruction. Consider any delays experienced from such obstructions as incidental to the paving operation. Protect all covers during asphalt paving.
- C. All surface structures and features located outside permissible excavation limits for underground installations, together with those within the construction areas which are indicated in the Plans as being saved, shall be properly protected against damage and shall not be disturbed or removed without direction from the Engineer. Within construction limits, as required, the removal of improvements such as paving, curbing, walks, turf, etc., shall be subject to acceptable replacement after completion of underground work. All expense of removal and replacement shall be borne by the Contractor to the extent that separate compensation is not specifically provided for in the Contract.

Obstructions such as street signs, guard posts, small culverts, mailboxes, and other items of prefabricated construction may be temporarily removed during construction provided that essential service is maintained in a relocated setting as accepted by the Engineer. Nonessential items shall be properly stored for the duration of construction. Upon completion of the underground work, all such items shall be replaced in their proper setting at the sole expense of Contractor.

Contractor shall be responsible for protection of existing overhead utilities and poles. This shall include arranging with and paying the utility for holding poles close to the edge of any trench. Holding of poles and repair of any damage to these facilities shall be considered incidental to the project with no additional compensation allowed. If relocation or removal of these facilities is required, Contractor will contact the concerned utility and pay for relocation or removal at no additional expense to Owner.

3.7 EXCESS MATERIALS

Dispose of all excess materials at the Contractor's expense. Make arrangements for the disposal and bear all costs or retain any profit incidental to such disposal.

3.8 CONTRACTOR'S RESPONSIBILITY

Settlement of replaced pavement over trenches within the warranty period shall be considered result of improper or inadequate compaction of sub base or base materials. Contractor shall promptly repair all pavement deficiencies during the warranty period at Contractor's sole expense.

3.9 ROCK SURFACING

Where existing, place crushed rock surfacing material, as specified herein, for the full width of all streets, driveways, parking areas, street shoulders, and other areas disturbed by hand labor where necessary. Level and grade the rock to conform to existing grades and surfaces.

3.10 DIRECTIONAL BORING

Horizontal directional boring/drilling (HDD or Horizontal Directional Drilling) installation shall be accomplished where shown on Plans or in the Special Provisions to minimize disturbance of existing surface improvements. Contractor may elect to complete work using HDD methods if acceptable to the Engineer. The installer shall have a minimum of three years of experience in this method of construction and have installed at least 20,000 feet of 8-inch or larger diameter pipe to specified grades. Field supervisor employed by Contractor shall have at least three years of experience and shall be on site at all times during boring/drilling installation, and be responsible for all of the work.

Contractor shall submit boring/drilling pit locations to the Engineer before beginning construction.

Drilling equipment shall be capable of placing the pipe as shown on plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe, without intermediate pits, a minimum distance of 200 feet. The guidance system shall be capable of installing pipe within 1-1/2 inch of planned vertical dimensions and 2 inches of horizontal dimensions. Contractor shall be required to abandon pipes which vary in depth and alignment from these tolerances. Contractor shall reinstall pipes to proper depth and alignment at no additional cost to Owner.

Pull back forces shall not exceed allowable pulling forces for the pipe being installed. Drilling fluid shall be a mixture of water and bentonite clay. Disposal of excess fluid and spoils shall be the responsibility of Contractor.

3.11 CULVERTS

- A. All culverts removed because of interference with new construction shall be removed with the least possible damage to pipe or basin. Dispose of culvert pipe in too poor condition for replacement because of age, physical condition, or other reasons.
- B. Culverts anticipated to be removed must have elevations taken to ensure proper replacement. Replace all pipes to the lines and grades specified within the construction plans. Use a minimum six-inch (6") thick stone aggregate base under pipe eighteen inches (18") and larger.

C. Replace culvert headwalls of all types to a condition at least equivalent to their original shape or form.

3.12 **RESTORATION OF SURFACE IMPROVEMENTS**

Wherever any surface improvements such as pavement, curbing, pedestrian walks, fencing, or turf have been removed, damaged or otherwise disturbed by Contractor's operations, they shall be repaired or replaced to the Engineer's satisfaction. Each item of restoration work shall be completed as soon as practicable after installation and backfilling operations on each section of pipeline.

The in place pavement structure (including base aggregates) shall be restored in kind and depth as previously existed or to the detail shown on drawings, whichever is more stringent.

Existing concrete and bituminous surfaces at the trench wall shall be sawed or cut with a cutting wheel to form a neat edge in a straight line before surfaces are to be restored. Sawing or cutting may be accomplished as a part of removal or prior to restoration at the option of Contractor. However, all surface edges will be checked prior to restoration.

3.13 TURF RESTORATION

Turf restoration shall be accomplished by sod placement except where seeding is specifically allowed or required.

Topsoil shall be placed to a minimum depth of four inches under all sod and in all areas seeded. The topsoil material used shall be light friable loam containing a liberal amount of humus and shall be free of heavy clay, coarse sand, stones, plants, roots, sticks and other foreign matter. Topsoil meeting these requirements shall be selected from excavated materials to the extent available and needed. If additional topsoil is required, Contractor shall provide it at no additional cost to the Owner.

3.14 **RESTORATION OF MISCELLANEOUS ITEMS**

Wherever any curbing, curb and gutter sections, pedestrian walks, fencing, driveway surfacing, or other improvements are removed or in any way damaged or undermined, they shall be restored to original condition by repair or replacement as the Engineer considers necessary. Replacement of old materials will be acceptable only to the extent existing quality can be fully achieved, such as in the case of fencing. Otherwise new materials shall be provided and placed as the Engineer directs. Workmanship and finished quality shall be equal to new construction.

A proper foundation shall be prepared before reconstructing concrete or bituminous improvements. Unless otherwise directed, granular material shall be placed to a depth of at least four inches under all concrete and bituminous items. No direct compensation will be made for furnishing and placing this material even though such course was not part of the original construction.

3.15 MAINTENANCE AND FINAL CLEANUP

All subgrade surfaces shall be maintained acceptably until the start of surfacing construction or restoration work, and until work has been finally accepted. Additional materials shall be provided and placed as needed to compensate for trench settlement and to serve as temporary construction pending completion of the final surface improvements.

Final disposal of debris, waste materials, and other remains or consequences of construction, shall be accomplished intermittently as new construction items are completed and shall not be left to await final completion of all work. Cleanup operations shall be considered as being a part of the work covered under Contract Items involved and only work which cannot be accomplished at any early time shall be considered as final cleanup work not attributable to a specific Contract Item.

If disposal operations and other cleanup work are not conducted properly as construction progresses, Engineer may withhold partial payments until such work is satisfactorily pursued or deduct the estimated cost of its performance from partial estimate value.

Maintenance of sodded and seeded areas shall include adequate watering for plant growth and replacement of any dead or damaged sod as may be required for acceptance of the work.

END OF SECTION

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SECTION 02720

STORM DRAINAGE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Construction of pipes, drainage inlets, manholes, headwalls, and various drainage structures.

1.2 **RELATED SECTIONS**

- A. Section 02731 Wastewater Collection System
- B. Section 03310 Cast-In-Place Concrete

1.3 OPTIONS

A. The bid form and specifications describe several pipe materials. Owner will select the one to be used. Where manufacturers of material or equipment are named in the specifications, Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by Engineer as equivalent to those specified.

1.4 **REFERENCES (Latest Revision)**

- A. ASTM D 3740 Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM C 76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- D. ASTM C 443 Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- E. ASTM B 745/B 745M Corrugated Aluminum Pipe for Sewers and Drains.
- F. ASTM D 1056 Flexible Cellular Materials Sponge or Expanded Rubber.
- G. ASTM F 2306/F 2306M 12 to 60–Inch (300 to 1,500 mm) Annular Corrugated Profile–Wall Polyethylene (PE) Pipe and Fittings for Gravity–Flow Storm Sewer and Subsurface Drainage Applications.
- H. ASTM D 1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non–extruding and Resilient Bituminous Types).
- I. ASTM D 1752 Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

- J. ASTM D 2321 Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
- K. ASTM C 150 Portland Cement.
- L. ASTM C 144 Aggregate for Masonry Mortar.
- M. ASTM C 207 Hydrated Lime for Masonry Purposes.
- N. ASTM C 62 Building Brick (Solid Masonry Units Made From Clay or Shale).
- O. ASTM C 55 Concrete Brick.
- P. ASTM C 478 Precast Reinforced Concrete Manhole Sections.
- Q. ASTM C 1433 Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers.
- R. ASTM D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- S. ASTM D 6938 In Place Density and Water Content of Soil and Soil–Aggregate by Nuclear Methods (Shallow Depth).
- T. ASTM F 405 Corrugated Polyethylene (PE) Tubing and Fittings.
- U. ASTM C 913 Precast Concrete Water and Wastewater Structures.
- V. ASTM D 3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- W. ASTM F 477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- X. AASHTO M 294 Corrugated Polyethylene Pipe, 300 to 1500–mm Diameter.
- Y. ASTM F667 Large Diameter Corrugated Polyethylene Pipe and Fittings.

1.5 QUALITY ASSURANCE

- A. Material Review Contractor will furnish the Engineer and Owner a description of <u>all</u> material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and provides published data on their quality and performance.
- C. Subcontractor A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with their competence.

- D. Design Devices, equipment, structures, and systems not designed by Engineer and Contractor wishes to furnish, shall be designed by either a Registered Professional Engineer or by someone the Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before ordering.
- E. Testing Agencies Soil tests shall be taken by a testing laboratory operating in accordance to ASTM D-3740 and E-329 and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory and furnishes satisfactory certificates.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Material shall be unloaded in a manner avoiding damage and shall be stored where it will be protected and will not be hazardous to traffic. Contractor shall repair any damage caused by the storage. Material shall be examined before installation. Neither damaged nor deteriorated material shall be used in the work.

1.7 SEQUENCING AND SCHEDULING

A. Contractor shall arrange work so sections of pipes between structures are backfilled, checked, pavement replaced and the section placed in service as soon as reasonable after installation.

1.8 ALTERNATIVES

A. The intention of these specifications is to produce the best system for the Owner. If Contractor suggests alternate material, equipment or procedures will improve results at no additional cost, the Engineer and Owner will examine suggestion, and if accepted, it may be used. The basis upon which acceptance of an alternate will be given is its value to Owner and not for Contractor's convenience.

1.9 GUARANTEE

A. Contractor shall guarantee quality of materials, equipment, and workmanship for a minimum period of 12 months or as required by the local governing agency after acceptance. Defects discovered during this period shall be repaired by Contractor at no cost to the Owner.

1.10 EXISTING UTILITIES

A. All known utility facilities are shown schematically on the construction drawings, and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown, will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings. B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at 1–888–721–7877 (SC) or 811.

1.11 MEASUREMENT AND PAYMENT

- A. Pipe Culverts and Storm Drains Length of pipe will be paid for on a linear foot basis, as measured along the centerline, from end of pipe to end of pipe, end of pipe to center of structure or center of structure to center of structure. Payment of which will constitute full payment for all pipe, joints, filter fabric and bedding, including trenching, dewatering, excavation, backfill and compaction, surface clean–up, and all incidental labor and material necessary to complete the construction of pipe as required by this section of specifications.
- B. Drainage Structures Payment will be made on a contract unit price basis. Payment will constitute full payment for all dewatering, excavation, formwork, precast concrete, backfill, compaction, frames, gratings or covers, concrete, brick and all miscellaneous materials, surface clean-up and labor necessary to complete the construction.
- C. Headwalls Payment will be made on a contract unit price of each type. Payment will constitute full compensation for dewatering, excavation, formwork, all materials, and incidentals necessary to complete the construction.
- D. Sheeting and Bracing Will not be measured for direct payment. All costs and charges in connection therewith shall be reflected and included in the item of work to which it pertains.
- E. Subgrade Drain Payment will be made at the contract unit price per linear foot. Payment will constitute full payment for trenching, furnishing and installing perforated drain pipe with sock, furnishing and placing fine aggregate, proper backfilling, surface cleanup, acceptable connection to structures, and all work necessary to make the installation complete.
- F. Stone Foundation Will be measured by using the length and depth for which stone is ordered by Engineer, times a width of 4 feet wider than outside diameter of pipe barrel. Payment will include the cost of removing and disposing of the unsuitable material and furnishing and placing stone.
- G. Sand Foundation Will be measured by using the length and depth for which sand is ordered by Engineer, times a width of 4 feet wider than outside diameter of pipe barrel. Payment will include the cost of removing and disposing of the unsuitable material and furnishing and placing sand.
- H. Borrow Borrow material will be measured at the site by truck count, measuring capacity of truck if full, or estimating quantity if not full. The width of trench in which borrow is placed shall be limited to 4 feet wider than outside diameter of pipe barrel. If additional width is excavated, it shall be backfilled at Contractor's expense and a deduction of the extra quantity determined by truck count. Payment will include furnishing, hauling, placing, and compacting "borrow"

material. Payment will also include disposing of unsuitable material in an area furnished by the Contractor.

- I. Ditch and Swale Excavation Excavations required for the construction of new ditches or swales and regrading of existing ditches or swales will be paid for per linear foot of ditch or swale excavated.
- J. Connect Pipe to Existing Structures Payment will be made at the contract unit price for each pipe size connected. For precast structures, payment shall include cost of dewatering, excavation, coring, installing, and grouting in pipe, backfilling, compaction and all work necessary to complete the connection. For brick structures, payment shall include cost of dewatering, excavation, cutting a hole, installing and grouting in pipe, backfilling, compaction and all work necessary to complete the connection.
- K. Pipe Video Payment will be made at the contract unit price per linear foot. Payment will include all equipment, labor, and materials necessary to televise and video record 50% of pipes under roadways as chosen by the Engineer. Contractor shall provide Engineer with one copy of the video recording.

1.12 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 1556 or ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
 - 1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
 - 2. testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
 - 3. Contractor abuses the services or interferes with work of testing laboratory in conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 PIPE

- A. Concrete Pipe Shall be reinforced Class III, Class IV, or Class V and shall conform to ASTM Specification C–76. Pipe less than 48 inch inside diameter shall be manufactured without lifting holes. Joints shall be either 'O' ring watertight flexible rubber, or tongue and groove as indicated on the plans. Gasketed single offset joints may be used in lieu of 'O' ring joints if acceptable to the Engineer.
 - 1. 'O' Ring Joints Shall be water tight flexible rubber gasket and shall meet ASTM Specification C-443.
 - 2. Gasketed single offset joint shall be soil tight and shall meet ASTM Specification C-443.
 - 3. Tongue and groove joints shall utilize mastic sealant and the exterior shall be wrapped with geotextile material.
- B. Snap-Tite Pipe Shall be acquired from Snap-Tite at the required lay lengths to properly line pipes as shown in the construction plans.

2.2 DRAINAGE STRUCTURES

- A. Details See plans.
- B. Concrete Reinforced and non–reinforced.
 - 1. Minimum compressive strength = 3,000 p.s.i. at 28 days.
 - 2. Reinforcing shall be covered by a minimum 1 inch of concrete for top slabs and 1–1/2 inches for walls and bases and 3 inches where concrete is deposited directly against the ground.
 - 3. Expansion joint filler materials shall conform to ASTM D 1751 or D 1752.
- C. Mortar Connection of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C-150, Type I or II. The sand shall conform to ASTM C-144 and shall be of an accepted gradation. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 25% of cement volume used. Hydrated lime shall conform to ASTM C-207, Type S. Quantity of water in the mixture shall be sufficient to produce a workable mortar, but shall in no case exceed 7 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes from time ingredients are mixed with water.
- D. Brick Masonry Brick shall conform to ASTM Specification C–62, Grade SW or C– 55, Grade S. Mortar for jointing and plastering shall consist of one part Portland cement and two parts fine sand. Lime may be added to the mortar in an amount not more than 25% of the cement volume used. Joints shall be completely filled and shall be smooth and free from surplus mortar on the inside

of structure. Brick structures shall be plastered with 1/2 inch of mortar over entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course, and for round structures, brick shall be laid radially with every sixth course a stretcher course.

- E. Precast Shall be constructed in accordance with ASTM C–478, C–913, or C–1433 and conform to details on the project drawings.
 - Joints Shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B "Tylox" conforming to ASTM C443 and mastic shall be "Ram-nek" or equivalent with primer. Primer shall be applied to all contact surfaces of manhole joints at the factory in accordance with manufacturer's instructions.
 - 2. Steps Shall be polypropylene equivalent to M.A. Industries, Type PS-1 or PS-1-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
 - 3. Leaks No leaks in the manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part portland cement and two parts clean sand; mixing liquid shall be straight bonding agent equivalent to "Acryl 60."
- F. Frame, cover & grating shall conform to details shown on the project drawings. Grates in pavement and in other flush-mounted type surfaces shall be of a "bicycle-safe" configuration consisting of 45 degree diagonal bars or slotted grates with a maximum clear opening of 1 inch and a maximum length of 9inches. In any case, the long dimension of openings should be located transverse to direction of traffic when possible.

2.3 FILTER FABRIC

A. Shall be a non-woven heat-bonded fiber of polypropylene and nylon filaments equivalent to Mirafi 140 N. The fabric shall be finished so filaments will retain their relative position with respect to each other. Fabric shall contain stabilizers and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultraviolet and/or heat exposure. The product shall be free of flaws, rips, holes, or defects.

2.4 SOILS AND STONE AGGREGATES

- A. Stone aggregate shall be clean crushed granite or concrete meeting the gradation requirements of grade No. 57.
- B. Soils used for bedding, haunching, and initial backfill shall be as shown in the following table and shall meet requirements and classifications of ASTM D2321 and ASTM D2487.

				Perc	entage Pas Sieve Sizes	sing
Class	Туре	Soil Group Symbol D 2487	Description	1–1/2 inch (40 mm)	No. 4 (4.75 mm)	No. 200 (0.075 mm)
IB	Manufactured, Processed Aggregates; dense-graded, clean.	None	Angular, crushed stone (or other Class 1A materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils; contain little or no fines.	100%	≤50%	<5%
		GW	Well-graded gravels and gravel-sand mixtures; little or no fines.		<50% of "Coarse	
	Coarse – Grained Soils, clean	GP	Poorly–graded gravels and gravel–sand mixtures; little or no fines.	100%	Fraction "	Fraction " <5%
11		SW	Well-graded sands and gravelly sands; little or no fines.		>50% of "Coarse	
		SP	Poorly–graded sands and gravelly sands; little or no fines.		Fraction "	
	Coarse–Grained Soils; borderline clean to w/fines.	Eg. GW– GC, SP– SM.	Sands and gravels that are borderline between clean and with fines.	100%	Varies	5% to 12%
		GМ	Silty gravels, gravel–sand–silt mixtures.		<50% of "Coarse	
	Coarse-Grained	GC	Clayey gravels, gravel-sand- clay mixtures.	10097	Fraction	E 07
	Soils with Fines	SM	Silty sands, sand-silt mixtures.	100%	>50% of	5/0
		SC	Clayey sands, sand–clay mixtures.		"Coarse Fraction "	
1) / A	Fine-grained soils	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, silts with slight plasticity.	100%	100%	>5097
IVA	(inorganic)	CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays.	100%	100%	<i>></i> 30%

2.5 **PRODUCT REVIEW**

A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products by the submittal of shop drawings before they are ordered.

PART 3 – EXECUTION

3.1 ON SITE OBSERVATIONS OF WORK

A. The line, grade, deflection, and infiltration of storm sewers shall be tested by Contractor under direction of Engineer. Owner's Representative or Engineer will have the right to require any portion of work be completed in their presence and if work is covered up after such instruction, it shall be exposed by Contractor for observation. However, if Contractor notifies Engineer such work is scheduled and the Engineer fails to appear within 48-hours, Contractor may proceed. All work completed and material furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed. All materials not conforming to requirements of specifications shall be removed from the work upon notice being received from Engineer for rejection of such materials. Engineer shall have the right to mark rejected materials to distinguish them as such.

Contractor shall give the Project Engineer or Project Representative a minimum of 48-hours notice for all required observations or tests. Storm sewers shall be dry for observation by the Engineer. Lines under water shall be pumped out by Contractor prior to observation, at no additional cost to the Owner.

It will also be required of Contractor to keep <u>accurate</u>, legible records of the location of all storm sewer lines and appurtenances. These records will be prepared in accordance with paragraph on "Record Data and Drawings" in the Special Conditions. Final payment to the Contractor will be withheld until all such information is received and accepted.

3.2 EXCAVATION FOR PIPE AND STRUCTURES

- A. Excavated material shall be piled a sufficient distance from the trench banks to avoid overloading to prevent slides or cave-ins.
- B. Remove from site all material not required or suitable for backfill.
- C. Grade as necessary to prevent water from flowing into excavations.
- D. Remove all water accumulating in the excavation, from surface flow, seepage, or otherwise, by pumping or other acceptable method.
- E. Sheeting, bracing or shoring shall be used as necessary for protection of the work and safety of personnel.

3.3 TRENCHING FOR PIPE

A. Trenching for Pipe – The width of trenches at any point below top of pipe shall be not greater than outside diameter of pipe plus 4 feet to permit satisfactory jointing and thorough bedding, haunching, backfilling and compacting under and around pipes. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over-excavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this re-design

and increased cost of pipe or installation shall be borne by Contractor without additional cost to the Owner. When installing pipe in a positive projecting embankment installation, the embankment shall be installed to an elevation of at least 1 foot above top of pipe for a width of five pipe diameters on each side of pipe before installation of pipe.

B. Removal of Unsuitable Material – Where wet or otherwise unstable soil, incapable of supporting the pipe is encountered in bottom of trench, such material shall be removed to depth required and replaced to proper grade with stone or sand foundation as determined by Engineer. This foundation shall be compacted to 95% modified proctor.

3.4 **PROTECTION OF UTILITY LINES**

A. Existing utility lines shown on drawings or locations of which are made known to the Contractor prior to excavation, and are to be retained, as well as utility lines constructed during excavation operations, shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired at Contractor's expense. If the Contractor damages any existing utility lines not shown on drawings or locations of which are not known to Contractor, report thereof shall be made immediately. If Engineer determines repairs shall be made by Contractor, such repairs will be ordered under the clause in GENERAL CONDITIONS of contract entitled "CHANGES." When utility lines to be removed are encountered within the area of operations, Contractor shall notify Engineer in ample time for necessary measures taken to prevent interruption of service.

3.5 FOUNDATION AND BEDDING

- A. Stone Foundation Where the subgrade of pipe is unsuitable material, Contractor shall remove unsuitable material to a depth determined by Engineer or Geotechnical Consultant and furnish and place stone foundation in trench to stabilize subgrade.
- B. Sand Foundation Where the character of soil is unsuitable, even though dewatered, additional excavation to a depth determined by Engineer or Geotechnical Consultant shall be made and replaced with clean sand furnished by Contractor.
- C. Bedding for pipe shall provide a firm surface of uniform density throughout the entire length of pipe. Before laying pipe, trench bottom shall be de-watered by the use of well points. Where well points will not remove the water, Contractor shall construct sumps and use pumps to remove all water from bedding surface. Pipe shall be carefully bedded in stone accurately shaped and rounded to conform to lowest 1/3 outside portion of circular pipe, or lower curved portion of arch pipe for the entire length of pipe. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type joint.
- D. Concrete Pipe:
 - 1. Materials for bedding concrete pipe shall be either Class II, Class III, or Class IB if processed, to minimize migration of adjacent material.

- 2. Depth of bedding shall be equal to 1/24 the outer diameter of pipe or 3 inches, whichever is greater.
- 3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 85% for Class II bedding and 90% for Class III bedding as determined by ASTM D1557.
- E. Polyethylene and Corrugated Aluminum Alloy Pipe
 - 1. Materials for bedding polyethylene and corrugated aluminum alloy pipe shall be either Class II, Class III, or Class IB if processed to minimize migration of adjacent materials.
 - 2. Depth of bedding shall be equal to 1/10 the outer diameter of pipe or a minimum of 6 inches, whichever is greater.
 - 3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 90% for Class II bedding and 95% for Class III bedding.

3.6 HAUNCHING, INITIAL BACKFILL, AND FINAL BACKFILL

- A. Haunching After the bedding has been prepared and pipe is installed, Class II or Class III soil shall be placed along both sides of pipe, in layers not exceeding 6 inches in compacted depth. Care shall be taken to insure thorough compaction and fill under haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers and rammers. Haunching shall extend up to the spring line of pipe and be compacted to following densities:
 - 1. RCP: Minimum density shall be 90% as determined by ASTM D1557.
 - 2. HDPE and Corrugated Aluminum Alloy Pipe: Minimum density shall be 95% as determined by ASTM D1557.
- B. Initial Backfill HDPE and corrugated aluminum alloy pipe require initial backfill material of either Class II or Class III soils to be placed from the spring line to a minimum of 6 inches above top of pipe in 6 inch lifts. This initial backfill shall be compacted to a minimum density of 95% as determined by ASTM D1557. Reinforced concrete pipe does not specifically require initial backfill. Initial backfill for reinforced concrete pipe can be the same as final backfill.
- C. Final Backfill For all pipes, it should extend to the surface and shall be select materials compacted to a minimum of 98% as determined by ASTM D1557 if pipe is under pavement. If pipe is in grassed areas final backfill may be native materials compacted to a minimum density of 90% as determined by ASTM D1557.

3.7 PLACING PIPE

- Each pipe shall be carefully examined before being laid, and defective or A. damaged pipe shall not be used. Pipe lines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall have been checked before backfilling. When storm drain pipe terminates in a new ditch, headwall or end section, together with ditch pavement, if specified, shall be constructed immediately as called for on the plans. Ditch slopes and disturbed earth areas shall be grassed and mulched as required. Contractor will be responsible for maintaining these newly constructed ditches and take immediate action subject to acceptance, keeping erosion of the ditch bottom and slopes to a minimum during life of contract. No additional compensation will be given to Contractor for the required diversion of drainage and/or dewatering of trenches. Grassing the trench backfill shall conform to requirements of Section 02902 - "Grassing."
- B. Concrete Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to insure uniform pipe support. Fill all voids under the pipe by working in backfill material.
- C. Corrugated Aluminum Pipe: Shall be laid with separate sections joined firmly together, with outside laps of circumferential joints pointing upstream and with longitudinal laps on the side. Lifting lugs, where used, shall be placed to facilitate moving the pipe without damage to exterior or interior coatings. Place pipe in trench with the invert conforming to required elevations, slopes and alignment. Fill all voids under the pipe by working in backfill material.
- D. Polyethylene Pipe Laying shall proceed upgrade with spigot ends of bell and spigot pipe pointing in the direction of flow. Place pipe in trench with the invert conforming to required elevations, slopes, and alignment. Provide bell holes in pipe bedding in order to ensure uniform pipe support. Fill all voids under the pipe by working in bedding material. Pipe shall be installed in accordance with ASTM D-2321.
- E. Subgrade Drain Tubing Shall be laid as detailed on construction drawings with the invert conforming to required elevations and alignment.

3.8 JOINTS IN PIPES

- A. Concrete Pipe Joints in concrete pipe shall be either 'O' ring watertight flexible rubber or tongue and groove as indicated on the plans. Gasketed, single offset joints may be used if accepted by the Engineer. Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
 - 1. 'O' ring and single offset joints shall meet the requirements of ASTM C443. They shall utilize either a rubber gasket with a circular cross section or a

rectangular cross section. Gaskets shall have no more than one splice, except two splices of the gasket will be permitted if nominal diameter of pipe exceeds 54 inches. Manufacturer's recommendations and requirements shall be followed.

- 2. Tongue and groove joints shall utilize a bituminous mastic such as Ram-Nek or accepted equivalent. The joint surfaces shall be primed according to manufacturer's recommendations. Care shall be taken to insure mastic material completely and uniformly seals the joint.
- 3. All tongue and groove joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.
- B. Corrugated Aluminum Pipe Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
 - 1. Installation of Gaskets Shall be in accordance with recommendations of the manufacturer in regard to use of lubricants and cements and other special installation requirements. Gasket shall be placed over one end of a section of pipe for half the width of a gasket. The other half shall be doubled over end of same pipe. When adjoining section of pipe is in place, the double–over half of gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so gasket covers ends of pipe sections equally. Connecting bands shall then be centered over the adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. The band shall be tightened evenly. Tension shall be kept on rods or bolts and gasket shall be closely observed to see it is seating properly in the corrugations.
 - 2. Installation of Filter Fabric at Joint After the connecting band has been tightened; Contractor shall place one layer of filter fabric completely around exterior of joint, a minimum of 2 feet wide, centered on joint, and overlapped a minimum of 1 foot.
- C. Polyethylene Pipe Maintain pipe alignment and prevent infiltration of fill material at joints during installation
 - 1. Joints shall be gasketed soil-tight and water-tight bell and spigot meeting ASTM F2306. Gaskets shall meet the requirements of ASTM F477. A joint lubricant supplied by manufacturer shall be used on the gasket and bell during assembly. Spigot end of pipe shall be inserted into bell using methods recommended by the manufacturer. Pipe shall be kept true to line and grade during assembly.
 - 2. Installation of Filter Fabric at Joint All polyethylene pipe joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.

D. Subgrade Drain Tubing – Joints shall be joined using snap couplings. When installing sock wrapped pipe, overlap sock ends over coupling and secure with polyethylene tape.

3.9 FIELD QUALITY CONTROL

A. Soil and density tests shall be made by a testing laboratory acceptable to the Engineer. Laboratory tests of the soil shall be made in accordance with ASTM D 1557. In-place density tests shall be made in accordance with ASTM D 6938. Results of tests shall be furnished to the Engineer.

The minimum number of tests required shall be:

Haunching and Initial Backfill in all areas	1 per 100–linear feet of pipe, minimum of one per run of pipe for both the haunching and initial backfill zones.
Final Backfill over pipe in traffic areas	1 per 100-linear feet or less for each 4-feet of depth or portion thereof.
Final Backfill over pipe in non-traffic areas	1 per 500-linear feet or less for each 6-feet of depth or portion thereof.

The minimum percent of compaction of the backfill material (in accordance to ASTM D1557) shall be the following:

In non-traffic Areas . . . 90% of maximum laboratory density, unless otherwise accepted by the Engineer.

Β. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by the Contractor on entire length of installed pipeline, not less than 30days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so the distance from external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of a run. When a deflection

device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be given acceptance prior to use. Device shall be sensitive to 1.0% of pipe diameter being measured and shall be accurate to 1.0% of the indicated dimension. Installed pipe showing deflections greater than 5% of normal pipe diameter shall be retested by a run from the opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.

C. 50% of pipes under roadways shall be televised and video recorded. The video observation shall include a complete pan view of each joint. If the video observation indicates problems, further televising may be required. Additional televising and video recording will be at no additional cost to the Owner.

3.10 DRAINAGE STRUCTURES

A. Drainage structures shall be constructed of materials specified for each type and in accordance with details shown on the drawings.

3.11 REMOVE AND REPLACE PAVEMENT

A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be constructed in accordance with latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled per State Department of Transportation regulations.

3.12 CONNECT PIPE TO EXISTING STRUCTURES

A. Contractor shall connect pipe to the existing structure where indicated. For brick or precast structures, a hole not more than 4 inches larger than outside diameter of new pipe shall be cut or cored neatly in the structure, new pipe laid so it is flush with inside face of structure, and annular space around pipe filled with a damp, expanding mortar or grout to make a watertight seal.

END OF SECTION

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SECTION 02722 - WATER MANAGEMENT SERVICES

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SECTION 02722

WATER MANAGEMENT SERVICES

PART 1 – GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all supervision, labor, material and equipment required to provide continuous, uninterrupted storm drainage for the duration of the construction. The temporary storm drainage system (ditch, pipe, pump, flap gates, and any other necessary stormwater management devices) shall have a minimum conveyance equal to or greater than the existing storm drainage system.

1.2 **RESPONSIBILITY**

- A. The Contractor shall install, furnish, and maintain all necessary temporary storm drainage systems to provide the same existing level of flood protection 24 hours per day, 7 days per week. The Contractor shall maintain the drainage system to allow continuous, uninterrupted drainage throughout the construction period. In addition, the Contractor will provide a supervisory level individual to be on call at all times to maintain, modify, and respond to weather dictated demands. Upon construction completion, the Contractor shall promptly remove any temporary storm drainage system and restore the area to its original or better condition.
- B. The Contractor is responsible for all cost and liability for any water damages resulting from improper execution of the water management's services.
- C. Contractor is responsible for floodproofing the construction area. Contractor is responsible for all cost, liability, time, material, equipment, etc. for flood damages occurring to the construction project.
- D. The Contractor shall be responsible for the control of groundwater within work areas at all times during construction.

1.3 MEASUREMENT AND PAYMENT

A. Water Management - Payment for work and materials covered by this section shall be included in the contract lump sum price. Payment will include all equipment, labor, and materials necessary to maintain uninterrupted storm drainage for the duration of the project.

PART 2 – PRODUCTS

2.1 MATERIALS

A. All material and equipment used in the stormwater management operations shall be new or in acceptable condition when first installed and shall remain in an acceptable condition throughout the construction period.

END OF SECTION

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SECTION 02902 - GRASSING

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SECTION 02902

GRASSING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Seeding, planting grass, and fertilizing graded areas behind the structures, pipeline rights-of-way, roadway shoulders and other disturbed areas.
- B. Seed protection.
- C. Maintaining seeded areas until final acceptance.

1.2 RELATED WORK

A. Civil and Landscape plans and specifications.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable. Store in cool, dry locations away from contaminants.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer. Damaged bags are not acceptable. Store in cool, dry locations away from contaminants.
- C. Deliver sod on pallets.
- D. All material shall be acceptable to Engineer prior to use.

1.4 PLANTING DATES

A. This specification provides for establishment of a permanent grass cover between the dates of March 1 and September 30. If finished earth grades are not completed in time to permit planting and establishment of permanent grass during the favorable season between dates specified above unless otherwise accepted, Contractor will be required to plant a temporary cover to protect new graded areas from erosion and to keep windborne dust to a minimum. The temporary cover shall be planted between October 1 and February 28 unless otherwise permitted.

1.5 MEASUREMENT AND PAYMENT

A. When the season or stage of project is such results of grassing work cannot be determined, conditional acceptance will be made on work completed. When conditional acceptance is made for items of work covered, Contractor shall be entitled to 50% of bid price for the actual work placed and shall receive remaining 50% of bid price when final acceptance is made. Conditional acceptance shall not apply to the remaining items of work, and full bid price payment shall be made

when work is acceptably placed and completed in accordance with specifications.

B. Payment for grassing will be made at contract unit price for the item "Grassing" and such payment shall constitute full compensation for furnishing and placing seed and fertilizer or sod where directed and protecting and maintaining seed and sod in all graded and disturbed areas.

PART 2 – PRODUCTS

A. Contractor shall submit source and species certification documents to Engineer and Owner's Representative for review prior to installation. Supply complete information on all analysis/test methodologies and results; laboratory certifications, manufacturer's specifications, and agency approvals to the Landscape Architect/Project Engineer prior to placement of soil mixtures. In addition, provide the Landscape Architect/Project Engineer with thoroughly mixed sample of soil mixes for acceptance prior to placement. Landscape Contractor shall make modifications and improvements to soil mixes deemed necessary by the soil analysis to meet requirements specified here in before, and to ensure proper growing medium for plant material.

2.1 SEED

- A. All seed shall conform to State Laws and requirements and regulations of the State Department of Agriculture.
- B. The varieties of seed, as specified in Section 2.2, shall be individually packaged or bagged, and tagged to show name of seed, net weight, origin, germination, lot number, and other information required by the State Department of Agriculture.
- C. Engineer reserves the right to test, reject, or accept all seed before seeding.

2.2 SEEDING SCHEDULE

Α.	<u>SEED</u>	RATE	<u>PLANTING</u>	<u>PLANTING DATES</u>		
	Bermuda	50-lbs/acre	March 1 –	September 30		
	Rve	75-lbs/acre	October 1 –	February 28		

2.3 FERTILIZER

A. Commercial fertilizer of accepted type, conforming to State fertilizer laws at the rate as recommended by soils test.

2.4 LIME

A. Agricultural grade, ground limestone at the rate as recommended by soils test.

2.5 SPRIG

A. Healthy living stems, stolons, or rhizomes and attached roots of locally adapted grass without adhering soil, including two to three nodes and from 4 to 6 inches

long. Obtain from heavy, dense certified sod. Provide sprigs which have been grown under climatic conditions similar to those in the locality of project. Coordinate harvesting and planting operations to prevent exposure of sprigs to the sun for more than 30 minutes before covering and moistening. Sprigs showing signs of wilt, mold, containing weeds or other detrimental material or are heat damaged will be rejected.

- B. Varieties of sprig, as specified in section 2.6, shall be individually packaged or bagged, and tagged to show name of sprig, net weight, origin, and other information required by the State Department of Agriculture.
- C. Sprigs shall be pure to variety specified and shall be free of other grass species, weeds or foreign matter.
- D. Sprigs shall be harvested by digging (not collected above soil level), shredding sod, rototilling sod and raking, vericutting, or with a sprig harvester. Sprigs shall consist of mostly rhizomes and crowns with only a few green leaves.

2.6 SPRIGGING SCHEDULE

A.	<u>SPRIG</u>	RATE	<u>PLANTING DATES</u>		
	'Tifsport' Bermuda	1,000 bushels/acre (Maximum 12 week grow	April 1 -in)	-	August 31
	Stabilize site with temporary grass seed		September 1 – March 31 (See section 2.2)		

B. In areas where existing grass is to be matched, Contractor shall sprig at the rate and dates recommended by sprig distributor.

2.7 SOD

- A. Sod shall be premium grade, densely rooted, good quality grass of the species and certified variety as shown on the plans, free from noxious weeds with no surface soil being visible. The sod shall be obtained from areas where the soil is reasonably fertile. Sod of specified species shall be grown from seed or sprig with not less than 95 percent germination, 85 percent pure seed, and not more than 0.5 percent weed seed. The sod shall be machine cut to a uniform soil thickness that shall contain practically all of the dense root system and not be less than 1– inch thick.
- B. Before cutting, sod shall be mowed to a height of not less that 1–1/2-inches or more than 2-inches. Sod shall be cut in minimum uniform widths of 12-inches and lengths of 24 inches.
- C. Sod shall be delivered to site in a fresh, moist condition with healthy green foliage. It shall be unloaded from delivery trucks on pallets or in rolls and placed in final position within 24 hours of delivery. Sod shall be protected from wind and sun and shall not be allowed to dry out before planting.
- D. Sod shall be strong enough to support its own weight and retain its size and shape

when suspended vertically from a firm grasp on the upper 10 percent of the section.

2.8 ACCESSORIES

- A. Straw Mulch: Oat or wheat straw, reasonably free from weeds, foreign matter detrimental to plant life, and in dry condition.
- B. Excelsior Mulch: Excelsior mulch shall consist of wood fibers cut from sound, green timber. The average length of fibers shall be 4 to 6 inches. Cut shall be made in such a manner as to provide maximum strength of fiber, but at a slight angle to natural grain of the wood to cause splintering of fibers when weathering in order to provide adherence to each other and to soil.
- C. Wood cellulose fiber shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form a homogenous slurry. Mulch fibers shall intertwine physically to form a strong moisture holding mat on the ground surface and allow rainfall to percolate into underlying soil. The mulch shall be heat processed to contain no germination or growth-inhibiting factors. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

2.9 PRODUCT REVIEW

A. Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 **PREPARATION**

- A. Areas to be seeded shall be made smooth and uniform and shall conform to the finished grade indicated on plans.
- B. Remove foreign materials, plants, roots, stones, and debris from surfaces to be seeded.
- C. Grassing areas, if not loose, shall be loosened to a minimum depth of 3 inches before fertilizer, seed or sod is applied.
- D. Amendments to soils shall be incorporated into loosened 3-inch top soil layer as recommended by soils tests.
- E. Contractor shall provide Topsoil Analysis Tests performed by a State Agricultural Experiment Station, Soil and Water Conservation District, State University, or other qualified private testing laboratory, as acceptable to Landscape Architect/Project Engineer. Soils test shall identify existing pH and nutrient levels, as well as recommended adjustments based on the type of grass to be installed.

3.2 STAND OF GRASS

- A. Before acceptance of seeding, sodding, or sprigging is performed for the establishment of permanent vegetation, Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of re-establishment in spring.
- B. Before acceptance of seeding is performed for the establishment of temporary vegetation, Contractor will be required to produce a stand of grass sufficient to control erosion for a given area and length of time before the next phase of construction or establishment of permanent vegetation is to commence.

3.3 SEEDING AND SPRIGGING DATES

A. Seeding and sprigging shall be performed during periods and at rates specified in their respective schedules. Seeding and sprigging work may, at discretion of Contractor, be performed throughout the year using schedule prescribed for given period. Seeding and sprigging work shall not be conducted when the ground is frozen or excessively wet. Contractor will be required to produce a satisfactory stand of grass regardless of the period of year work is performed.

3.4 APPLYING LIME AND FERTILIZER

A. Following advance preparation and placing selected material for shoulders and slopes, lime and fertilizer, if called for based on soil tests, shall be spread uniformly over the designated areas, and shall be thoroughly mixed with the soil to a depth of approximately 2 inches. Fertilizer and lime shall be applied at the rate recommended by required soils test. Unless otherwise provided, lime will not be applied for temporary seeding. In all cases where practicable, acceptable mechanical spreaders shall be used for spreading fertilizer. On steep slopes subject to slides and inaccessible to power equipment, the slopes shall be adequately scarified. Fertilizer and seed. When fertilizer is applied with combination seed and fertilizer drills, no further incorporation will be necessary. The fertilizer and seed shall be applied together when Wood Cellulose Fiber Mulch is used. Any stones larger than 2-1/2 inches in any dimension, larger clods, roots, or other debris brought to the surface shall be removed.

3.5 SEEDING

- A. Seed shall be sown within 24 hours following application of fertilizer and lime and preparation of the seedbed as specified in Section 3.4. Seed shall be uniformly sown at rate specified by the use of acceptable mechanical seed drills. Rotary hand seeders, power sprayers or other satisfactory equipment may be used on steep slopes or on other areas inaccessible to seed drills.
- B. Seeds shall be covered and lightly compacted by means of cultipacker or light roller if the drill does not perform this operation. On slopes inaccessible to compaction equipment, the seed shall be covered by dragging spiked chains, by light harrowing or by other satisfactory methods.
- C. Apply water with fine spray immediately after each area has been sown.

- D. Do not sow seed when ground is too dry, during windy periods or immediately following a rain.
- E. If permitted by the special provisions, wood cellulose fiber mulch or excelsior fiber mulch may be used.

3.6 SEED PROTECTION (STRAW MULCH)

A. All seeded areas seeded with permanent grasses shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations, using at least 2 tons of straw per acre.

3.7 SEED PROTECTION (EXCELSIOR MULCH)

A. Seed shall be sown as specified in Section 3.5. Within 24 hours after covering of seed, excelsior mulch shall be uniformly applied at the rate of 2 tons per acre. The mulch may be applied hydraulically or by other acceptable methods. Should the mulch be placed in a dry condition, it shall be thoroughly wetted immediately after placing. Engineer may require light rolling of the mulch to form a tight mat.

3.8 SEED PROTECTION (WOOD CELLULOSE FIBER MULCH)

A. After the lime has been applied and ground prepared as specified in Section 3.4, wood cellulose fiber mulch shall be applied at a rate of 1,500 pounds per acre in a mixture of seed and fertilizer. Hydraulic equipment shall be used for application of fertilizer, seed, and slurry of the prepared wood pulp. This equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, and water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge line shall be equipped with a set of hydraulic spray nozzles which will provide an even distribution of slurry on various areas to be seeded. The slurry tank shall have a minimum capacity of 1,000 gallons.

Seed, fertilizer, wood pulp mulch, and water shall all be combined into the slurry tank for distribution of all ingredients in one operation by hydraulic seeding method specified herein. Materials shall be combined in a manner recommended by the manufacturer. The slurry mixture shall be regulated so amounts and rates of application shall result in a uniform application of all materials at rates not less than amount specified. Using the color of wood pulp as a guide, equipment operator shall spray prepared seedbed with a uniform visible coat. The slurry shall be applied in a sweeping motion, in an arched stream to fall like rain, allowing wood fibers to build upon each other until an even coat is achieved.

3.9 SPRIGGING

- A. Sprigs shall be placed at the date and rates as shown in section 2.6. The sprigging method shall be by broadcast sprigging, hydroplanting or row planter. Sprigging procedure shall ensure even coverage.
- B. Sprigs applied by broadcast over the site with a distributor or hydroseeder shall be planted at the rates listed in section 2.6. Cover broadcast sprigs with straw mulch immediately after broadcast and water in immediately (within 2 hours).
- C. Sprigs installed by row planter creating a narrow furrow that covers 50 to 80% of

the sprig with soil may use less sprig material. Rate shall be as recommended by sprig supplier to provide a solid stand of turf within the time required in Section 2.6. Water in immediately (within 1 hour).

3.10 SODDING

- A. Sod shall be placed between March 1st and December 1st. However, if sod is to be placed during periods of temperatures over 90 degrees F., the Contractor shall take extra care for quick placement of sod with adequate, consistent watering necessary to ensure sod thrives as planted.
- B. Sod shall be placed within 24 hours of cutting.
- C. Place top elevation of sod 1/2 inch below adjoining paving or curbs.
- D. All areas to be sodded shall be brought to the proper line grade or cross section as was existing prior to construction. Sod shall be placed so, upon completion, edges of sodded areas will be smooth and will conform to the proposed finished grade. Sod shall be laid smooth, edge to edge, with staggered joints. Sod shall be immediately pressed firmly into contact with the sod bed by tamping or rolling, to eliminate any air pockets. A true and even surface shall be provided, to insure knitting without displacement of the sod or deformation of the sodded areas surfaces. Do not stretch or overlap sod pieces. Following compaction, screened soil of good quality shall be used to fill all cracks. Excess soil shall be worked into the grass with rakes or other suitable equipment. On slopes steeper than 3 to 1, sod shall be fastened in place with suitable wood or metal pins to hold the sod in place. Any damage by erosion or other causes occurring after completion of grading operations shall be repaired, before commencing with the sodding operations.
- E. Immediately before sodding, moisten topsoil with a fine spray to a minimum 1inch depth. Sod shall not be laid on dry or powdery soil.
- F. Sod shall be moist when laid and placed on moist ground. The sod shall be carefully placed by hand, beginning at the toe of slopes and working upwards. The length of strips shall be at right angles to flow of surface water. All joints shall be tightly butted and end joints shall be staggered at least 12 inches. Sod shall be immediately pressed firmly into the ground by tamping or rolling. Fill all joints between strips with fine screened soil. Sod on slopes shall be pegged with sod pegs to prevent movement.
- G. Within two hours after sod has been placed, thoroughly water to a minimum depth of 4-inches. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove depressions and irregularities. Roll sodded areas with a roller not exceeding 150 lbs. per foot of roller width.

PART 4 – MAINTENANCE, WARRANTY AND ACCEPTANCE

4.1 MAINTENANCE

- A. Maintain grassed surfaces until final acceptance.
- B. Maintenance shall consist of providing protection against traffic, watering to

ensure uniform seed germination and to keep surface of soil damp, and repairing any areas damaged as a result of construction operations or erosion. Maintenance shall also include, but is not limited to, watering, weeding, cultivating, removal of dead material, lawn mowing, fertilizing, and other necessary operations.

C. The Contractor shall maintain all proposed plantings until the date of substantial completion issued by the Owner.

4.2 WARRANTY

- A. All grassed areas shall be guaranteed by Contractor to be alive and healthy for a one year period from date of substantial completion issued by the Owner. A final walk through with the Owner shall be conducted at end of warranty period to determine if any areas require replanting. At end of warranty period, sod shall show evidence of rooting to underlying soil and shall have no competitive weed growth from either the sod or from between sod joints.
- B. Any grassed area which is dead or not showing satisfactory growth shall be replaced at Contractor's expense at the end of warranty period. All replacement shall be of original quality. Replacement required because of vandalism, excessive use, or other causes beyond the control of Contractor are not part of this contract.

4.3 ACCEPTANCE

- A. Before acceptance of seeding performed for the establishment of permanent vegetation, Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of reestablishment in spring.
- B. A minimum coverage of 80% density over 100% of the disturbed area is required for seeded areas before project acceptance. Sprig and sod areas shall have 95% coverage over 100% of the disturbed area prior project acceptance.

END OF SECTION

APPENDIX A



SNAP-TITE® CULVERT LINING FIELD GUIDE FOR INSTALLATION, HANDLING, AND STORAGE





CULVERT-REHAB.COM 1-800-CULVERT Q3 2023


HOW THIS GUIDE CAN HELP YOU

This guide was written for those who handle and install High Density Polyethylene (HDPE) Snap-Tite® Culvert Liners and accessory products like Hydro-Bell, Thread Liner, and oval Snap-Tite® pipe. This guide is not intended to provide design information, nor to assume the responsibility of the engineer (or other customer representative) in determining procedures for the specific job conditions to attain best performance of the liner.

Contractors, maintenance crews, engineers, superintendents, supervisors, and laying crews will find information to guide them. This manual will also be of help in selecting the needed materials to complete a culvert-lining project.

WARRANTY

ISCO Industries, Inc. warrants that our products are manufactured in accordance with the applicable material specifications, and are free from defects in workmanship and materials using our specifications as a standard. Every claim under this warranty shall be deemed waived unless in writing and received by ISCO industries, Inc. within thirty (30) days of the date the defect was discovered, or should have been discovered and within one (1) year of the date of the shipment of the product. ISCO Industries, Inc. makes no other representation or warranty of any kind, expressed or implied, in fact or in law, including without limitation, the warranty of merchantability or the warranty of fitness for a particular purpose, other than the limited warranty set forth above.

LIMITATION OF LIABILITY

ISCO Industries, Inc's liability is limited to the replacement of defective product, and ISCO Industries, Inc. shall have no liability whatsoever, except where damage or a claim results solely from breach of ISCO Industries, Inc.'s warranty. In no event shall ISCO Industries, Inc. be liable for any special, incidental consequential, or other damages whether or not similar to the proceeding, under any theory including negligence, breach of warranty, or strict liability.



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For more information on Snap-Tite installation, visit https://culvert-rehab.com/resources/installation/.





DID YOU KNOW?

Snap-Tite® now meets the AASHTO standard M326. This is the **ONLY** standard for relining culverts. State Departments of Transportation, counties and municipalities are facing a critical problem, which has lead AASHTO (American Association of State Highway Transportation Officials) to create this standard. Culverts installed 40 to 50 years ago are failing at an alarming rate nationwide. Thousands of corrugated metal culverts are so significantly rusted that a danger of sink holes, road collapse or flooding exists. The solution: A Snap-Tite® Culvert Lining System.

isco

RECEIVING, HANDLING, AND STORAGE

RECEIVING AND INSPECTING SNAP-TITE® SHIPMENTS

Upon arrival of each liner shipment, carefully inspect the liner. The liner was carefully loaded at the factory using methods acceptable to the carrier and it is their responsibility to deliver the pipe in good condition. It is the responsibility of the receiver to make certain there has been no loss or damage in transit.

The packing list, which accompanies each shipment, provides a complete list of all items included. Check the load against the packing list. The driver should also have a box of gaskets to deliver with the pipe. The delivering truck driver should ask the person receiving the shipment to sign the Bill of Lading, and acknowledge that the load was received in good condition. Note on the Bill of Lading any damage, missing packages, etc. at that time. Immediately report shipping problems such as damage, missing packages, document discrepancies, incorrect product, etc. File shipping claims within 7 days or as standard ISCO Terms and Conditions dictate (see https://isco-pipe.com/ terms-and-conditions/ for full details).

DAMAGE INSPECTIONS



Damage such as cuts, scrapes, gouges, tears, cracks, punctures, and the like may occur during handling and installation. Excessive damage could compromise pipeline performance. In many markets

where pipelines are under pressure, the industry standard for HDPE pipelines is that damage should not exceed about 10% of the minimum wall thickness required for the pipeline's operating pressure or the minimum wall thickness required to meet structural design requirements.

If damage is not excessive, the shape of the damage may be a consideration. Sharp notches and cuts may be dressed smooth to blunt any notches. Blunt scrapes or gouges should not require attention. Minor surface abrasion from sliding on the ground or insertion into a casing should not be of concern.

In gravity flow and low pressure head applications like a Snap-Tite culvert liner, excessive damage like deep gouges, cuts or grooves may be evaluated based on site-specific criteria. Deeper gouges that do not penetrate to the pipe ID (and capable of withstanding grout pressures) may be considered acceptable, since a grouted liner carries very little, if any, structural load. When deemed necessary, repair methods are available to fill excessively deep cuts, abrasions, grooves, punctures or tears with new HDPE material.

LIFTING EQUIPMENT

Unloading and handling equipment must be appropriate for the type of packaging, must be in safe operating condition, and must have sufficient capacity (load rating) to safely lift and move the product as packaged. Equipment operators should be trained and, preferably, certified to operate the equipment.

When using a forklift, or forklift attachments on equipment such as articulated loaders or bucket loaders, lifting capacity must be adequate at the load center on the forks. Forklift equipment is rated for a maximum lifting capacity at a distance from the back of the forks. Reduce the lifting capacity if the weightcenter of the load is farther out on the forks.



Before lifting or transporting the load, spread forks as wide apart as practical. Forks should extend completely under the load, using fork extensions if necessary, and the load should be as far back on the forks as possible. During transport, a load

on forks that are too short or too close together, or a load too far out on the forks, may become unstable and pitch forward or to the side, and result in damage to the load or property, or hazards to persons.

Above the load lifting equipment such as cranes, extension boom cranes, and side boom tractors, should use wide fabric choker slings that are secured around the load or to lifting lugs on the component. Spreader bars should be used when lifting pipe or components longer than 20 feet. Before use, inspect slings and lifting equipment. Equipment with wear or damage that impairs function or load capacity should not be used.



HANDLING AND UNLOADING SNAP-TITE® PIPE

HDPE piping product transportation and handling is generally subject to governmental safety regulations such as OSHA in the United States or CCOSH in Canada. Persons transporting and handling HDPE piping products should be familiar with applicable governmental safety regulations. Additional HDPE pipe handling and transportation information is available in the Material Handling Guide from the Plastic Pipe Institute (www. plasticpipe.org). However, the responsibility for safe transport and handling rests primarily with persons that actually perform transport and handling activities.

Loading and unloading areas should be isolated and those not directly involved in the loading or unloading process should vacate the control area during material handling process. The contractor or owner should have written safety procedures to help prevent loss or injury on the work site. At no time shall workers walk on top of pipe loads, nor shall they place themselves beneath suspended loads. Wear appropriate personal protective equipment; hard hats, gloves, safety glasses, and steel-toed boots are recommended. Safety is the responsibility of the installing contractor or owner.

Observe safe handling and operating procedures. Although PE piping components are lightweight compared to similar components made of metal, concrete, clay, or other materials, larger components can be heavy.

Drivers contracted by ISCO Industries, Inc. to pick up and deliver HDPE to job sites are expected to adhere to ISCO standards regarding HDPE pipe handling, loading and unloading pipe. Handling and unloading equipment can be a wide variety of options, such as forklifts, cherry pickers, or front-end loaders with forks. However, the means by which pipe products are unloaded at the job site is the responsibility of the customer.

Give special attention while strapping and unstrapping loads. All personnel must be vigilant for sliding and rolling pipes while near trucks and lifting equipment. Take precautions to ensure that pipe is not dropped or damaged. Pipe, fittings, and special fabrications must not be pushed, rolled, or dumped off the truck.

...................

The following are recommendations and guidelines to motor carriers for handling and unloading HDPE pipe at job sites.

- Park the truck on level ground with parking brake on and wheels chocked.
- Check the load to ensure that it has not shifted.
- Ensure that material handling, such as forklift, cherry picker, or front-end loaders with forks or spreader bar and lifting straps is available and adequate for the lift. Only properly trained personnel should operate unloading equipment. If you are using a forklift, have the forks spread as wide as possible for handling HDPE pipe.
- Be aware that HDPE pipe becomes very slippery to handle when wet, and avoid sharp and sudden movements when pipe is in contact with the forks.
- Do not move the truck if the straps are not secure around the pipe.
- Position the mechanical handling equipment before removing straps from the top unit loads.
- Do not stand on unsupported pipe! This can be extremely dangerous. Make sure the pipe is secure and supported by appropriate material handling equipment before mounting pipe to remove bands



- When cutting bands, cut only the bands securing the top tier to the tiers below. Do not stand on the banded pipe while cutting. Bands under tension can spring back when cut.
- Remove one unit at a time. If a strip board is across the top of a unit, remove it before lifting the pipe.
- When using a forklift to remove the pipe, the forks should enter the load slowly, taking care not to dam age the pipe with the fork tips.
- If a forklift is not available, appropriately rated material-handling equipment such as a cherry picker or front-end loader with forks or spreader bar and lifting strap may be used.
- Do not use the forklift or other material handling equipment to push the load off the truck, as this is hazardous to unloading personnel and may damage the pipe and/or trailer.
- Personnel not involved in the unloading of the pipe should remain completely clear of the danger zone.
- Consider appropriate personal protective equipment as necessary such as gloves, hard hats, steel-toed footwear, and eye and hearing protection.
- THINK SAFETY and use caution at all times.

UNLOADING SITE/STORAGE

A suitable unloading site will be generally level and large enough for the carrier's truck, handling equipment and its movement, and for temporary load storage. General requirements for long-term storage are for the area to be of sufficient size to accommodate piping components, to allow room for handling equipment to get around them and to have a relatively smooth, flat, level surface free of stones, debris, or other material that could damage pipe or components, or interfere with handling. For some projects, several storage or staging sites along the right-of-way may be appropriate, while a single storage location may be suitable for another job. The site and its layout should provide protection against physical damage to components.



Pipe may be placed on 4-inch wide wooden dunnage or similar as shown in Figure 1-1. Middle support(s)/dunnage board(s) are not always required but may be useful as pipe diameters get smaller or as lengths increase. Using the boards will help maintain clearance for forklift forks or lifting slings. Using boards also helps create clearance for the pipe from water, where flotation of the plastic pipe could be at risk. Avoid storing Snap-Tite pipe in areas where flooding or washout could occur to avoid pipe movement.



Supports for the pipe should be a minimum distance of 3 feet away from each end. Supports that are closer to the ends increase the stress at the Snap-Tite male and female ends and can cause a crack to develop when the loading becomes excessive. Take care to insure no direct impacts or dropping the ends on the ground or against other surfaces as that can create the same stress event.



ENVIRONMENTAL: EXPOSURE TO UV AND COLD WEATHER

Snap-Tite and other HDPE piping products are protected against deterioration from exposure to ultraviolet (UV) light and weathering effects with antioxidants, and thermal and UV stabilizers. Black HDPE pipe and fittings contain at least 2% carbon black to limit the effects of UV attack. Black HDPE pipe and fittings are suitable for outdoor storage without covering or protection against UV exposure.

Temperatures near or below freezing will affect PE pipe by increasing stiffness and reducing resistance to impact damage. PE remains ductile at temperatures below -40°F (-40°C). In cold conditions, allow more time to conduct handling and installation procedures that bend and flex the pipe. Take extra care not to drop pipe or special fabrications, and to keep handling equipment and other things from making forceful impacts to the pipe.

Ice, snow, and rain are not harmful to the material, but unsure footing and traction require greater care and caution to prevent damage or injury. Inclement weather can make pipe surfaces especially slippery. Do not walk on pipe.

SUPPLIES, EQUIPMENT, AND METHODS

MATERIAL AND PROJECT CHECKLIST: SNAP-TITE® INSTALLATION

SNAP-TITE® LINER PIPE

- Snap-Tite Gaskets (Should be delivered with the pipe)
- Slikstyx or similar lubricant (vegetable spray) (Should be delivered with the pipe)
- Rags to clean the pipe joints before connecting
- Mastic for oval pipe (Should be delivered with the pipe)

GROUTING AND VENTING OPERATIONS

- PVC pipe (24"-36" long) for Vents
- PVC pipe to pump grout (Quantity varies based on culvert length; see pages 28-30 for recommendations)
 DVC Cluster Classer
- PVC Glue/Cleaner
- PVC Male Threaded Adapters for connection to Grouting Equipment/hoses
- PVC End Caps to match PVC tubes or Oakum or rags to plug grout ports

** Normal Grout and Vent pipes are 2" Sch 40 PVC,but smaller annular spaces may dictate smaller diameter pipes

EQUIPMENT FOR JOINING AND MOVING PIPE

- 20-foot to 30-foot Chains
- Chain with Binders
- Chain Come-A-Long (See page 16 for sizing guidelines)
- Backhoe/Track hoe project dependent on site
- Choker cable (See page 20 for sizing assistance)
- 4x4 or 6x6 Post or plate material for pushing liner
- Pry bars/crow bars and/or long handled flat screwdrivers
- Chainsaw or reciprocating saw for trimming extra pipe, lumber, and nose cone (if required).
- Constructing a nose cone may require heavy-duty mechanics wire or steel wire rope to pull the sections together.

CONTINUED ON PAGE 12

CONTINUED MATERIAL AND PROJECT CHECKLIST: SNAP-TITE® INSTALLATION

MATERIALS USED FOR BLOCKING

- 2x4's or similar lumber for blocking material
- Screws (typically self-tapping -3" or longer) and/or ram set to bolt the 2"x4"s to the liner or host pipe, respectively
- Metal banding material with clamps if clamping blocking to liner pipe

BULKHEAD MATERIALS

- Ready-mix (see page 42 for mix design)
- Wheelbarrow or "portable mixer"
- Shovels
- Trowel
- Water
- Sealant like hydraulic water stop cement
- Road or geotextile fabric
- Alternate approaches include brick, oakum, chemical grout, or industrial grade closed-cell geotechnical polyurethane foams(requires spray foam application equipment)

GROUTING OPTIONS

- Grout pump and concrete/cement/grout
- Foaming machine (for cellular grouts) and foaming agent
- Fuel for equipment
- Water truck or other source
- Test cylinders when density checks are required

SUGGESTED CREW

- 4 laborers (which includes 2 people on the pipe joint for sizes 20" and up)
- I machine operator or winch for smaller sizes and lengths
- Radios
- Traffic control where necessary



TYPICAL/STANDARD METHOD OF PROCEDURE FOR RELINING CULVERTS

A DETAILED WORK PLAN SHOULD COVER MANY OF THESE ITEMS

1. Assessment and Inspection

- Host Pipe Cleaning (if required)
- Video Inspection (if required)

2. Sizing and Cleaning

- Verification of host pipe length, internal dimensions, and adequate clearance
- Blunt any sharp edges and remove debris, obstructions, and other hindrances to insertion

3. Methodology, Staging, and Job Prep

- Water control (coffer dams, bypass pumping) as needed
- Erosion Control, as required
- Determination of Push/Pull or combination
- Coordination of access, storage, and staging areas
- Grout Tube lengths and location map
- Vent Port location map
- Permits, as needed

4. Staging and Site Prep

- Installation of Blocking and Rails as needed
- Installation of Grout and Vent Tubes
- Liner Connection Areas

5. Pipe Installation

6. Bulkhead Installation

7. Grouting of Annular Space

- Grout mix density (including foaming instructions and equipment, when used)
- Grout lift plan and calculations in cases where multiple lifts are used
- Pressure monitoring of inlet and/or lowest location

8. Post Installation Acceptance

- Video Inspection (if required)
- Testing (if required)
- Waste removal, cleanup, and restoratio

COME-ALONG METHOD

Snap-Tite is so easy to install that most jobs can be completed with a backhoe, shovels, a come-along, and chains. Chain come-alongs are recommended over cable come-alongs for Snap-Tite installations since cable types can stretch and fray. Chains and come-alongs capacities are based on the size of liner to be installed. Standard chain come-alongs are available with load ratings of 1,000 to 5,000 lbs. of force. Verify the amount of force that the come-alongs are capable of applying before using them. For safety reasons, the chains normally are able to handle twice the load applied by each come-along.

Most chains have a working load. The working load is the normal rating for typical lifting applications. The strength at failure is usually four times the working load. When a chain is wrapped around a Snap-Tite liner and tightened with a chain binder, it is under tensile loading.





After a come-along is attached to a chain link, the link is subject to cross loading. A cross load occurs because the chain must wrap around the pipe to transfer the forces. As the cross load is increased, the angle of the chain around the liner changes. See diagram below:





Position of chain before load - Top View

Chain under load - Side View

Chain manufacturers reduce the working load by 25% for cross loading. A chain with a standard rating of 6,000 lbs. is only rated for 4,500 lbs. in this application. If you have determined that you need 6,000 lbs. working load on the chain for a Snap-Tite Installation, then use an 8,000 lbs. working load rated chain.

Joining forces shown in Table 2-1 change with temperature, type of lubrication, male-female joint alignment, presence of debris, slope and time. Estimated forces are based upon the slow application of force with flat slope and lubricated joint. A slow application of force allows materials to stretch. Fast joining requires more force and energy because material does not immediately increase in size. More force will be required below 73 degrees F. Forces are estimated only! Forces shown in Table 2-1 are based on properly aligned 24-foot lengths. If different lengths are used, more or less force will be required.

TABLE 2-1

ESTIMATED FORCE TO JOIN SNAP-TITE® LINER						
SNAP-TITE® LINER OD (IN)	WEIGHT PER FT (LBS)	APPROX WEIGHT PER 24' (LBS)	ESTIMATED JOINING FORCE (LBS)	ESTIMATED TOTAL FORCE (LBS)	TYP MINIMUM LOAD RATING FOR EACH COME-ALONG (LBS)	
10.75	4.8	118	500	618	1000	
12.75	6.7	164	1000	1164	1000	
14	8.1	198	1000	1198	1000	
16	10.6	260	1000	1260	1000	
18	13.4	328	1000	1328	1000	
20	16.5	404	1000	1404	1000	
22	20.0	490	1000	1490	1000	
24	23.8	583	1500	2083	2000	
26	27.9	684	1500	2184	2000	
28	32.4	794	1500	2294	2000	
30	37.2	911	1500	2411	2000	
32	42.3	1036	2000	3036	3000	
36	53.6	1313	3000	4313	3000	
42	72.9	1786	3000	4786	3000	
48	95.2	2332	3000	5332	3000	
54	102.6	2514	3000	5514	4000	
63	164.3	4025	4000	8025	5000	



Apply the full load once the male and female joints come together straight on and part of the flat surface on both sides "catches." The best joining procedure is to watch the joining process and make adjustments based on observations. When pipe movement requires more force than expected, look for a reason. If the joints do "catch", rotation of the two liner sections or alignment with a pry bar may solve the problem. Sometimes changing the angle of attack or moving the pipe up and down or side to side will help start the connection.

If the male end is at a slight angle to the female and partially inserted, lower force is required to make the joints mate. Apply force from one come-along until liner bends slightly. Apply force slowly, this allows the female joint to expand.



CAUTION Be careful when tightening a chain or cable!

Snap-Tite liners are not perfectly round. Take care to get alignment around the circumference of the Snap-Tite joint. Pry bars are sometimes used to help align the joints. Changing the position of come-along on the Snap-Tite liner may be helpful.

Be aware of the applied force. Allow only needed personnel near the come-along and chains. All others must remain at a safe distance from the chain. All personnel must use safety equipment during installation. Use gloves, hard hats, safety glasses and other personal protective equipment (PPE).

Chain wraps on the liner slip less than cable. Chains appear to be safer for this use. The mechanisms used in a come-along often fail when over stressed; be careful when using comealong!

Special safety equipment is required if there is moving water present, electrical lines are close to installation or if there are hazardous material in pipes. Check your job site and be prepared.

CHOKER METHOD

The Choker Method is another approach to installing Snap-Tite pipe. With this installation procedure, come-along and chains are not needed. The excavator/backhoe will do most of the work snapping the joints together.

To begin lining, slide the first piece of Snap-Tite pipe into the existing structure with at least two feet extending outside of the existing host pipe to allow room for connecting the joint. Before connecting the next pipe to the first one, install the gasket on the male end to ensure a watertight fit (see page 32).

Wrap a choker cable (minimum ¾") or chain around the pipe inserted in the culvert. Tighten the cable or chain down on the liner pipe as to keep the cable/chain from moving/ sliding and attach the excess cable/ chain to the



machine used. You can attach the cable/chain in the eyelet. Slowly back the machine up to fully tighten the choker against the liner.

The inserted piece of Snap-Tite is secured to prevent further movement into the host pipe, the operator will lower the mating piece of pipe into the ditch and the crew will vertically and horizontally align the male and female ends.



Line the joints up and slowly pull the pipe towards the 'choked' pipe. The tapered end of the male joint will line up with the beveled end. Once the alignment is equal around the pipe, the operator will slowly apply pressure by pulling the pipe he had held with his bucket and a choker cable/chain. The operator will slowly rock the joint left to right, 'walking' the joint together.



Once the spigot joint is connected, the backhoe can push the remainder of the pipe further into the host pipe. Repeat this process until the liner is installed completely through the host pipe.



CHOKER METHOD DETAILS



TYPICAL CABLE LENGTHS AND DIAMETER				
12" - 18" Liner Pipe	5/8" Cable x 5' Long			
20" - 24" Liner Pipe	5/8" Cable x 8' Long			
30" Liner Pipe	5/8" Cable x 10' Long			
36" Liner Pipe	5/8" Cable x 12' Long			
48" Liner Pipe	5/8" Cable x 16' Long			
48" and Greater	3/4" Cable x "X" Long			

CHOKER CABLE FORMULA

OD of Liner Pipe x 3.14 ÷ 12 = Feet Around Pipe Add Length Needed for Tail-End

30" Liner Pipe X 3.14 = 94.2 ÷ 12 = 7.85 + 4 = 12 ft Cable

In this example, a tail length of just over 4' was assumed adequate.

SNAP-TITE® PIPE INSTALLATION STEPS

EXAMPLES OF FAILING CORRUGATED METAL AND CONCRETE CULVERTS



Invert rusting and voids underneath



Complete loss of pipe bottom/invert



EXAMPLES OF FAILING CORRUGATED METAL AND CONCRETE CULVERTS



Misaligned joint with voids



Loss of bottom from pipe exit



STEP 1:

PREPARE THE EXISTING CULVERT

Inspect the culvert to ensure no obstructions prevent insertion of the liner. Flush and/or clean the existing culvert.

Prior to lining, check each culvert for access. Evaluate the safety of the installation area. Clear an area near the culvert for access. There must be an open area equal to the liner section on at least one end of the culvert.

Inspect vertical and horizontal alignment of host pipe to ensure clearance for the liner pipe. Take measurements at various locations throughout the host culvert to verify the smallest ID, as well as total length. Consider a survey for complex installations.

Remove dirt and rocks from the culvert. If a culvert requires cleaning, a water truck or jet cleaner may be needed. After cleaning and preparing the culvert for lining, make sure there is nothing protruding from the culvert that will damage the liner.



Evaluate the invert and channel bed conditions of the culvert. If there are voids around the old culvert, consider filing these voids prior to lining. If a high flow grout is used, these voids will often be filled as the liner is grouted. However, the amount of grout required to complete the job can become high and unknown.



It is possible to install Snap-Tite culvert liners when water is present. Installation during low flow conditions presents low safety risk. Fast flowing water can create a safety hazard. Use good judgement if water is present. Grouting with standard cement grout can be done when water is present. Special precautions may be required when grouting with cellular grout and water is present. Consult your grout supplier if water is present.



STEP 2:

ADD BLOCKING TO EXISTING/HOST CULVERT

If needed, attach wooden "blocks" to the top of the host pipe in order to keep the Snap-Tite pipe from rising up.

Controlling the location of the liner inside the culvert is important. Flotation of the liner is of concern when grouting around the liner or there is ground water present. As grout density increases, upward buoyant forces increase. A liner is like a boat - it displaces the grout and if the liner weighs less than the grout, the liner floats. To prevent flotation, use blocks or skids around the pipe to maintain grade of the Snap-Tite Culvert Liners.

Blocking usually is not required for smaller culvert sizes, when the annular space is less than 4". As the culvert size increases and the liner size decreases, the need for blocking to hold grade becomes more important. Use blocking at the top of the host to keep the liner close to the bottom of the culvert. Blocking on the bottom of the existing pipe is not always necessary, but it does help facilitate insertion by helping slide past corrugations, damaged inverts, and separated or misaligned joints.



Figure 3-1 on pages 28-29 shows typical blocking of Snap-Tite[®] Culvert Liner. Blocks or skids are typically installed in a staggered pattern. Spaces are left between the blocks or skids allow grout to flow under and around the liner. Beveling skids and blocking may help faciilate easier installation of liner pipe.

Install blocks in the top 120 degrees of the culvert beginning at 4 feet from the inlet and outlet to allow for installation of the bulkhead. For culverts 36" in diameter or larger, blocks are attached to the old culvert. The first blocks are often installed at 11 and 1 o'clock positions, with a space of four to eight feet between the next set of blocks, based on liner size. Blocks are usually four to eight feet in length. The thickness is determined by the difference in the ID of the culvert and the liner.



The upper skids must have structural strength adequate to resist the buoyant force created as the liner is grouted in place. Wood and solid plastic will work. Styrofoam does not have adequate compressive strength to work for many liner sizes.

Filling the liner with water is one way to reduce flotation. Since water weight is 62.4 lbs. per cubic foot, if the grout has a higher density, filling the liner with water may not solve the problem. Filling the liner with water is usually not recommended, and can prove to be difficult in many cases.



STEP 3: HANG GROUT TUBES IN EXISTING/HOST CULVERT

If access is large enough, install different lengths of PVC pipe that will deliver the grout flow and also release air.

Before the liner pipe is inserted into the host pipe, use pipe straps and 3" Self Tap Screws to hang grout and vent tubes at approximately 4' spacing. Hang grout tubes between the blocking to protect it from damage during pipe liner installation. Use wire and screws in lieu of clamps if necessary.





TABLE 3-1

TYPICAL GUIDE FOR GROUT AND VENT TUBE PLACEMENT SITE CONDITIONS MAY VARY				
CULVERT LENGTH	AIR VENTS INLET SIDE*	AIR VENTS OUTLET SIDE*		
50' or less	12, 3, 9 O'Clock	12, 3, 9 O'Clock		
50' - 100'	12, 3, 9 O'Clock	12, 3, 9 O'Clock		
100' - 150'	12, 3, 9 O'Clock	12, 3, 9 O'Clock		
150' - 200'	12, 3, 9 O'Clock	12, 3, 9 O'Clock		
200' - 250'	12, 3, 9 O'Clock	12, 3, 9 O'Clock		
250' - 300'	12, 3, 5, 7, 9 O'Clock	12, 3, 5, 7, 9 O'Clock		
300' - 350'	12, 3, 5, 7, 9 O'Clock	12, 3, 5, 7, 9 O'Clock		
350' - 400'	12, 3, 5, 7, 9 O'Clock	12, 3, 5, 7, 9 O'Clock		

*All Air Vents are typically 2" Sch 40 PVC Pipe 3' in length. For Culverts over 400' in Length, consult a Snap-Tite[®] Sales Rep.



Refer to Figure 3-1 on the next page for graphic image

TYPICAL GUIDE FOR GROUT AND VENT TUBE PLACEMENT SITE CONDITIONS MAY VARY				
CULVERT LENGTH	GROUT TUBE(S) INLET SIDE (ALL NEAR 12 O'CLOCK)**	GROUT TUBE(S) OUTLET SIDE (ALL NEAR 12 O'CLOCK)**		
50' or less	1 at 10' long 🗖	1 at 10' long 🔺		
50' - 100'	1 at 20' long 🗖	1 at 20' long 🔺		
100' - 150'	1 at 30' long 🗖	1 at 30′ long 🔳		
150' - 200'	1 at 30′ long ■ 1 at 60′ long ■ 1 at 120′ long ▲	1 at 30' long 🔺 1 at 60' long 🔺		
200' - 250'	1 at 30' long ■ 1 at 60' long ■ 1 at 120' long ■	1 at 30' long 🔺 1 at 60' long 🔺 1 at 120' long 🔺		
250' - 300'	1 at 30′ long ■ 1 at 60′ long ■ 1 at 120′ long ■ 1 at 150′ long ▲	1 at 30' long		
300' - 350'	1 at 30' long ■ 1 at 60' long ■ 1 at 120' long ■ 1 at 150' long ■ 1 at 200' long ▲	1 at 30' long ↓ 1 at 60' long ▲ 1 at 120' long ▲ 1 at 150' long ▲		
350' - 400'	1 at 30' long ■ 1 at 60' long ■ 1 at 120' long ■ 1 at 150' long ■ 1 at 200' long ■ 1 at 300' long ▲	1 at 30' long 1 at 60' long 1 at 120' long 1 at 150' long ▲		

**All Grout Tubes are typically 2" Sch 40 PVC Pipe

Recommended

Suggested as extra tubes for challenging installations



PLAN VIEW OF CULVERT LINER INSTALLATION WITH FEED TUBES

FIGURE 3-1 THIS IS ONLY AN EXAMPLE, DESIGN MAY VARY







THE SNAP-TITE® SOLUTION

Railroad companies choose to use Snap-Tite because the Snap-Tite system does not require any special training or special equipment, so the railroad's maintenance crew can handle relining the failing culvert.

In addition, the Snap-Tite culvert lining system is a no-dig solution for culvert repair, meaning there is no need for major excavations or disruptions to the rail or road traffic during construction.

STEP 4: INSERT ONE END OF SNAP-TITE® CULVERT LINER INTO EXISTING CULVERT

Lower the first piece of Snap-Tite HDPE into position and insert into the host pipe.

To begin lining, slide the first piece of Snap-Tite pipe into the existing structure with at least two feet extending outside of the existing host pipe to allow room for connecting the joint. Point the male end of the Snap-Tite downstream, towards the outlet end. When required to assist installation, it may be necessary to create a "nose cone" by cutting the ends of the pipe. See directions beginning on page 61.



NOTE: A Hydro-Bell is designed to insert into the female end at the inlet end if these directions are followed and male end are pointed downstream (towards the outlet).



STEP 5:

POSITION THE NEXT SECTION OF SNAP-TITE® CULVERT LINER WITH PROPER ALIGNMENT

Lower the second piece of pipe into position and line with the first piece. Place the opposing end of a second section against the exposed end of the first section. The two sections must be in alignment and have the same slope.



Snap-Tite liners are not perfectly round. Due to the flexible nature of HDPE pipe, the male and female ends may not match up as perfectly round shapes. Some ovality may exist. To help with the joining process, this would be a good time to rotate the next section of pipe so that the best fit for alignment is achieved. Using boards, hydraulic rams/jacks, Porta-power, or other methods to reround the pipe may help achieve a better match.





Take care to get alignment around the circumference of the Snap-Tite joint. Pry bars are sometimes used to help align the joints. Changing the position of come-along on the Snap-Tite liner may be helpful.



STEP 6: INSTALL GASKET ON MALE END

Place a gasket on the male end of the liner in the first groove (top picture). Apply lubricant evenly to the gasket (bottom picture).

A gasket should be supplied with Snap-Tite pipe. Install the gasket in the first groove from the end on the male end to help make a watertight seal. Check the fit of the gasket around the liner. Apply lubricant to the entire circumference of the gasket. Apply the lubricant evenly to reduce the chance of a torn or rolled gasket.




STEP 7: ATTACH THE CHAINS AND COME-ALONGS OR CABLE COKER



Use come-a-longs and chains (placed approximately 180 degrees apart on each side) and pressure from the excavator to "snap" the two pieces of pipe together. Double-wrap the chains approximately two feet from the coupling end and tighten with binders. Attach one come-along on each side of joint, 180 degrees apart.





STEP 8: SNAP THE LINER TOGETHER

Align the ends of the male bevel inside the female bevel. Use a pry bar or move the come-along to different positions on liner if pipe is out of round to improve alignment.



Pull the ends together slowly, forcing the female end to expand and allow the male end to move into the female end. Apply force slowly and make observations. Apply force to one side until liner slightly deflects, then apply force on other side. Look for the female side to increase in OD as force is applied. Listen for two distinct popping sounds as they "snap" together



If chain or come-along appears to be overstressed, stop operation! Quickly move away from the chain! When lands and grooves are aligned, the couplings will "snap" and lock together. Allow time for this to occur.





If operation is stopped, check alignment. Often poor alignment or a stone or dirt in the grooves of the male/female ends may cause the need for additional pressure. Rotation of the liner will change alignment. Clean out the joint if needed.





STEP 9: PUSH/PULL JOINED LINERS INTO CULVERT AND REPEAT UNTIL COMPLETELY LINED



Remove chains or chokers and push or pull the joined liners into culvert. In some applications, it may be necessary to both push and pull the liner to achieve insertion in the host.



Repeat steps 5-9. Snap each new piece of pipe onto the proceeding pipe and push into the culvert, leaving enough pipe protruding from the culvert to join with the next length of liner.



Repeat the process until connected sections of Snap-Tite line the entire length of the culvert. Snap-Tite liner pipe will expand and contact therefore industry standard practice requires that a minimum of six inches of liner pipe to extend beyond the inlet and outlet ends of the host pipe.

JOINT INTEGRITY

Carefully following the procedures set out in this Field Guide will reduce the chance of leaks between joints. Dirt, sand, or rock in the joint area may affect the integrity of the joint and create leaks. Placement of a joint where the existing culvert bends or deflects, or where the joint is otherwise stressed may increase the chance of leakage. In these situations, shorter lengths of Snap-Tite Culvert Liner may sometimes be used to avoid the problem.



After the joints are complete, it is normal for a slight separation or gap at the joint due to the flexible nature of the pipe. The size of the gap may vary due to the thermally induced expansion and contraction experience by the pipe material during the course of installation. As liner sizes increase, a gap or separation up to 1" may be observed. The gasketed joint will prevent any grout penetration from outside and the gap should stabilize and not vary once the grout has cured.





STEP 10: SEAL THE CULVERT ENDS

Once the entire culvert is lined, build bulkheads or end-seals on each end of the culvert.

Before grouting, seal the annular space at both ends of the liner and culvert. Since most grouts flow like water, much of the grout will be lost if the old culvert is not sealed. Bulkheads are the best way to seal the annular space and prevent grout from escaping. Bulkheads must have sufficient strength to sustain hydrostatic pressure during annular grout placement.



Make an end seal for the annular space at a distance of one to two feet at each end using an appropriate mix. The end seal in the annulus can be made by using various materials. A relatively dry cement grout is used in most situations. Bricks, bags of cement, oakum, and chemical grout have also been used successfully.



While sealing the annular space, install vents to allow air to escape. Usually vents are installed at both ends of the culvert.

Snap<mark>Tite</mark>

CHECKLIST FOR BEST PRACTICES FOR BULKHEAD BUILDING

Proper bulkheads at both ends with vent tubes and grout tube(s) are required before grouting can begin.

- Allow the bulkheads to cure for a minimum of 24 hours before grouting.
- Once the bulkhead mix is on site and ready to be packed into the culvert, start by packing bulkhead mix at least ½" thick and a minimum of 2' deep around the bottom of the liner to prevent grout mix from leaking out during the grouting process.
- Place vent tubes at the highest point (12 O'Clock) on both ends of the culvert.
- Pay special attention to the areas around the outside of the old culvert and if there is any deterioration or holes, pack those areas with the bulkhead mix.





TYPICAL BULKHEAD MIX DESIGN (PRODUCES 1 CUBIC YARD)

- 2400 pounds of sand
- 752 pounds of cement or 8 bags
- 225 pounds of type C fly ash
- 25 gallon water
- Retarder depending on temperature outside
- Pack Bulkhead 2' deep on both ends

FIGURE 3-3 END VIEW OF BULKHEAD

Vent tubes places at 12, 3, and 9 o'clock Grout tubes places on both sides of top vent tube. All tubes near edge of existing culvert.



STEP 11: GROUT THE ANNULAR SPACE

Grouting the annular space between the existing culvert and the liner is recommended. Filling the annular space with grout provides additional structural support and prevents point loading.

After placing the Snap-Tite[®] Culvert Liner in the existing culvert, remove any water above the invert whenever possible. Keep water out of the annular space during the grouting process since it can interfere with the injection and curing of the grout.

The Snap-Tite Design Guide provides additional information on grouting but the major points for an installer to be aware are these:

- Due to the strength of the liner, grouting pressures should be limited to 2 psi. Groundwater and hydrostatic pressures at the liner may not be the same as measured at the grout pump.
- Cellular grouts are preferred due to flowability and low pressures
- Flowable fills can be used but will require more care and material
- Consider grouting in lifts in certain situations (See page 50-51 for more information)



GROUTING CONSIDERATIONS

Grout can be placed into the annular space in between a Snap-Tite[®] Culvert Liner and a culvert in many different ways. Evaluate each job based on the existing conditions. Some of these factors are:

Size of liner and size of existing host culvert
Elevation changes from upstream end to downstream
Grout Density
Access to injection point or points
Limitations on injection points
Length of culvert
Cost
Presence of ground water

THE GROUTING PROCESS

When installing grout, take your time. Watch the liner and pumping pressures. If deflection of the liners occurs, reduce pressure and stop pumping for a short time. Many problems occur when the process is rushed or someone gets in a hurry.

The grout may cause the pipe to float due to buoyant forces and open the joints if too much pressure is applied. Movement and excessive pressure may cause the joint to leak. Halt the grouting process if the joint appears to be compromised. Check all grouting pressures and the shape of the liner pipe before continuing or wait for the grout to set up before resuming.

For culvert/liner lengths of less than fifty feet, grout often can be placed by pouring the grout into place with grout holes. When the grade is relatively flat, this is a good approach. Pressure on the liner is usually minimal.



When it is possible to bore multiple openings in the existing host culvert (above the liner), grout can easily be poured in place at regular intervals (often 20-foot spacing). For culverts under roadways, this will usually require stopping traffic at least in one lane and repair of the borehole. Again, the pressure on the liner is minimal, but there may be other factors to consider.

Grouting starts at one end of the line and proceeds to the other end. Grout will become visible at each succeeding grout hole. Grouting will continue until each hole is filled with grout. Air must be pushed out of the annular space. Take your time; let air work its way out to prevent voids in the annular space. Voids reduce the strength of the system. Deflection and buckling are more likely in unreinforced liner areas. When void areas are detected, a hole can be drilled and grout injected with a wand.

Grout is normally installed from the upstream end of the culvert. When the culvert has a flat grade, grouting from the downstream end can be performed with few issues. As the elevation changes from one end of the culvert to the other, it is easier to install grout by filling from the upstream end.

When space allows, filling the annular space with grout from the inside of the liner is possible, but will often require grout ports be installed in the liner pipe wall. This method can also assist when the slope/curvature of the host pipe ceiling varies extensively across the length of the culvert as installing grout tubes would be challenging in this situation.

Grouting from the downstream end may be considered to assist in venting air and water. However, it often can create some challenges with grouting pressures and clogged grout ports. Grouting from the upstream end is preferred unless there are issues with access or space constraints.

A standpipe might be used to fill the annular space between the host pipe/culvert and the inserted liner. If the old pipe/ culvert is well below the roadway, a standpipe or extension hose is a good way to reach the fill pipe(s). However, once the air is fully vented or cannot escape, pressure on the liner can build up and apply a significant force at the bottom of the liner.



If the grout is heavier than water (true in all cases except cellular grouts), the head pressure will be even higher. If the liner is grouted in place in one pour or lift, this force of water or grout can collapse the liner when exceeding the allowable grout pressure of 2 psi. In this application, grouting in lifts is usually the best application method.



When the elevation change along a culvert is great, grout falls to the bottom of the annular space and fills the lowest grout tubes and vent ports. When the grout hardens, the fill pipe can no longer be used. Multiple fill pipes can be used to fill the annular space. Each fill pipe will be used to fill to a required elevation for that lift. Each fill pipe will usually be of a different length and elevation in the annular space. Remember, a pipe on a relatively flat pitch will receive grout much differently than a pipe with a 10% slope.

Vents are set at elevations required for each lift. Vent ports allow air to escape the annular space and can be used to verify grout levels during grouting.

The term "lifts" indicates that only a portion of the grout is poured into the annular space at one time. By placing only a portion of the grout around the pipe, the collapse force on the liner pipe is minimized. Grouting in lifts means that only a part of the grout is flowed around the liner and allowed to reach initial set or cure.



Allow the previous lift to set before beginning the next lift. By allowing each lift to harden before adding the next lift, the liner receives additional support and reduces the likelihood of collapse. The highest forces occur below the pipe's springline, so take your time during the first and second lifts. See Figure 3-4 below.

FIGURE 3-4 GROUTING IN LIFTS



Lifts may be necessary when there is a large change in elevation between culvert inlet and outlet resulting in higher pressures on the liner or bulkhead. As pipe size and/or slope increases, it becomes more important to evaluate hydrostatic loading and potentially place the grout in lifts. When there is several feet of uncured grout over the liner, the weight of the grout can be significant. Grouting in lifts is usually the best way to grout long runs with higher density grout formulations.



When grouting with multiple lifts, measure the amount of grout added per lift. Fill the annular space with the calculated amount of grout. Fill each lift with this calculated amount of grout. More grout will be required if there is a void around the old culvert. If the existing culvert is partially collapsed, less grout maybe required.



GROUT TYPES

Information on grout mixes are provided below as a guide only. Consult suppliers of grout additives or grouting contractors for additional information, including alternate or custom formulations.

The basic requirements for grout selection are flow and strength. You must be able place or transport the grout into the annular space with minimum pressure and it must have adequate strength to support the liner and reinforce the soil around the old culvert.

Cellular grouts have wetting agents that allow for the inclusion of air, which results in a mixture that is lighter than water. The addition of the air will reduce the amount of cement mixture that will be needed to fill the annular space. Cellular grouts are usually the only type of grout that will flow long distances under low pressure conditions. Cellular grout can solve issues related to the difficulties of pumping or flowing long distances with less than 2 psi of pressure.

Cellular grout can also reduce flotation forces. Select a cellular grout with a density between 20-40 pcf and a compressive strength in the range of 150 psi minimum compressive strength unless the project requires something greater. This compressive strength will adequately support the Snap-Tite[®] Culvert Liner in most situations. Have a structural engineer make evaluations or recommendations for your specific application.

Flowable fill, with densities greater than 100 pcf, has been used for many years to grout Snap-Tite[®] Culvert Liners in place. As the density increases, greater care is needed when placing it.

Increasing the size of the aggregate in the grout makes high compressive strength grout. As the aggregate size increases, the pressure and velocity required to keep aggregates from settling out becomes higher. Bridging occurs when sand or other aggregates deposit in one area causing a blockage. This occurs quickly if grout flow is stopped during placement while waiting for the next mix truck to deliver. Increasing the grout pressure to clear this blockage is not recommended. The increased pressure could cause the liner to buckle or collapse.



The following tables offer mix designs for grouting the annular space between the liner and the old culvert. These mixes are provided as guides only. Aggregates vary greatly. Consult your local ready mix supplier for their recommendations for grout and flowable fill. The mix designs are for one cubic yard of concrete.

The table below for low Density Cellular Concrete (LDCC) uses Aerix Industries Aerlite-iX foam at a 2.0 pcf foam density and 1:60 foam dilution ratio. Other grout mixes (30-90 pcf densities) are available upon request. If you are using a different foam concentrate, please contact Aerix Industries Technical Department.

					INS) NS	
(LB/FT ³)	CEMENT (LB)	WATER (GAL)	FOAM (LB)		WATER (GAL)	AERLITE-IX FOAM CONCENTRATE (OZ)	FOAMING TIMES (FOR 1 YD ³)
40 pcf	687	36	17.8	\leftarrow	4.25	8.8	54 secs
55 pcf	958	60	14	\leftarrow	3.3	6.9	42 secs
70 pcf	1230	76.5	10.5	\leftarrow	2.5	5.2	32 secs

TABLE 3-2

*Mix produces one cubic yard of Low Density Cellular Concrete (LDCC) **Foaming times are based on Aerix Industries T80-20 foam generator producing foam at 20 cfm. When using a different foam generator please contact Aerix Industries Technical Department.



The Federal Highway Administration provides some sample mix designs in Chapter 5 of the publication Fly Ash Facts for Engineers. While these mix formulations are not specifically designed for culvert applications, the project engineer can determine the suitability. The mix designs are for one cubic yard of flowable fill.

TABLE 3-3

FHWA MIX	DENSITY (LB/FT³)	CEMENT (LB)	FLY ASH (LB)	SAND (LB)	WATER (GAL)	AIR CONTENT %
Table 5-1	96.3 pcf	104	2,080	0	50	n/a
Table 5-2	129.6 pcf	100	300	2600	60	n/a
Table 5-3	110.8 pcf	50	350	2300	35	20-24

Table 5-1. High fly ash content mix Table 5-2. Low fly ash content mix Table 5-3. Flowable fill mix with high air content.



Additionally, Aerix Industries provides Controlled Low Strength Material (CLSM) flowable fill produced using AERFLOW. AERFLOW is a synthetic anionic liquid concentrate specially formulated to produce a stable, voluminous micro-bubbled foam. Admixtures like AERFLOW are used in direct combination with sand/cement slurries for the production of CLSM concrete, This material, also known as flowable fill, is engineered with densities ranging from 100 to 115 pcf. The mix designs are for one cubic yard of concrete. Other admixture suppliers may have different recommendations including amounts of admixture amounts.

**XIM	(LB/FT ³)	CEMENT (LB)	(TB) HSH ASH	(LB) (LB)	WATER (GAL)	AERFLOW (PER YD³)*
CF1	113.5 pcf	125-150	0	2600	30	3 oz.
CF2	115 pcf	75-100	0	2500	32	3 oz.
CF3	112 pcf	50	250	2500	34	3 oz.
CF4	110 pcf	50	350	2300	35	3 oz.

TABLE 3-4

*AERFLOW is added at the job site and mixed for 5 minutes at mixing speed

** Foam Enhancement changes a 1.5" (+/-) slump to 7"-9" slump

Note that CF4 matches the FHWA Table 5-3 mix and provides the amount of AERFLOW to create 20%-24% air content.

Below is a chart to help the installer identify the amount of pressure that is possible based on the density of the grout selected and the depth of height.

TABLE 3-5

G	GROUTING PRESSURE IN PSI BASED ON DENSITY AND DEPTH												
ıt (ft)	GROUT DENSITY (PCF)												
Heigh	TYPICAL CELLULAR GROUT DENSITY RANGE												
Lift I	30	35	40	45	50	55	60	65	70	75	80	85	90
1	0.21	0.24	0.28	0.31	0.35	0.38	0.42	0.45	0.49	0.52	0.56	0.59	0.62
2	0.42	0.49	0.56	0.62	0.69	0.76	0.83	0.90	0.97	1.04	1.11	1.18	1.25
3	0.62	0.73	0.83	0.94	1.04	1.15	1.25	1.35	1.46	1.56	1.67	1.77	1.87
4	0.83	0.97	1.11	1.25	1.39	1.53	1.67	1.81	1.94	2.08	2.22	2.36	2.50
5	1.04	1.22	1.39	1.56	1.74	1.91	2.08	2.26	2.43	2.60	2.78	2.95	3.12
6	1.25	1.46	1.67	1.87	2.08	2.29	2.50	2.71	2.92	3.12	3.33	3.54	3.75
7	1.46	1.70	1.94	2.19	2.43	2.67	2.92	3.16	3.40	3.65	3.89	4.13	4.37
8	1.67	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17	4.44	4.72	5.00
9	1.87	2.19	2.50	2.81	3.12	3.44	3.75	4.06	4.37	4.69	5.00	5.31	5.62
10	2.08	2.43	2.78	3.12	3.47	3.82	4.17	4.51	4.86	5.21	5.56	5.90	6.25
11	2.29	2.67	3.06	3.44	3.82	4.20	4.58	4.96	5.35	5.73	6.11	6.49	6.87
12	2.50	2.92	3.33	3.75	4.17	4.58	5.00	5.42	5.83	6.25	6.67	7.08	7.50
13	2.71	3.16	3.61	4.06	4.51	4.96	5.42	5.87	6.32	6.77	7.22	7.67	8.12
14	2.92	3.40	3.89	4.37	4.86	5.35	5.83	6.32	6.81	7.29	7.78	8.26	8.75
15	3.12	3.65	4.17	4.69	5.21	5.73	6.25	6.77	7.29	7.81	8.33	8.85	9.37

62.4 PCF= Unit weight of water

Yellow: Grouting pressure below 2:1 safety factor

Orange: Grouting pressure exceeds collapse pressure

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GROUTING PRESSURE IN PSI BASED ON DENSITY AND DEPTH										
t (ft)	GROUT DENSITY (PCF)									
Heigh	← TYP FOR REDUCED → DENSITY FLOWABLE FILL FOR FLOWABLE FILL									
Lift	135	130	125	120	115	110	105	100	95	
1	0.94	0.90	0.87	0.83	0.80	0.76	0.73	0.69	0.66	
2	1.87	1.81	1.74	1.67	1.60	1.53	1.46	1.39	1.32	
3	2.81	2.71	2.60	2.50	2.40	2.29	2.19	2.08	1.98	
4	3.75	3.61	3.47	3.33	3.19	3.06	2.92	2.78	2.64	
5	4.69	4.51	4.34	4.17	3.99	3.82	3.65	3.47	3.30	
6	5.62	5.42	5.21	5.00	4.79	4.58	4.37	4.17	3.96	
7	6.56	6.32	6.08	5.83	5.59	5.35	5.10	4.86	4.62	
8	7.50	7.22	6.94	6.67	6.39	6.11	5.83	5.56	5.28	
9	8.44	8.12	7.81	7.50	7.19	6.87	6.56	6.25	5.94	
10	9.37	9.03	8.68	8.33	7.99	7.64	7.29	6.94	6.60	
11	10.31	9.93	9.55	9.17	8.78	8.40	8.02	7.64	7.26	
12	11.25	10.83	10.42	10.00	9.58	12.22	8.75	8.33	7.92	
13	12.19	11.74	11.28	10.83	10.38	9.93	9.48	9.03	8.58	
14	13.12	12.64	12.15	11.67	11.18	10.69	10.21	9.72	9.24	
15	14.06	13.54	13.02	12.50	11.98	11.46	10.94	10.42	9.90	

TABLE 3-6

GROUTING VOLUME OF ANNULAR SPACE									
HOST CULVERT SIZE (IN)	SNAP-TITE [®] LINER OD (IN)	CU FT/ FT OF CULVERT	CU YD/ 10 FT OF CULVERT						
12	10.75	0.16	0.06						
15	12.75	0.34	0.13						
18	14	0.70	0.26						
18	16	0.37	0.14						
21	16	1.01	0.37						
21	18	0.64	0.24						
24	18	1.37	0.51						
24	20	0.96	0.36						
24	22	0.50	0.19						
27	22	1.34	0.49						
27	24	0.83	0.31						
30	24	1.77	0.65						
30	26	1.22	0.45						
36	28	2.79	1.03						
36	30	2.16	0.80						
36	32	1.48	0.55						
42	32	4.04	1.49						
42	36	2.55	0.95						
48	42	2.95	1.09						
54	42	6.28	2.33						
54	48	3.34	1.24						
60	48	7.07	2.62						
60	54	3.73	1.38						
66	54	7.85	2.91						
66	63	2.11	0.78						
72	63	6.63	2.45						

NOTE: Minimum estimate grout volume based on calculated annular space. Additional volume may be required to fill any voids.



EXAMPLES OF A REHABILITATED CULVERTS AFTER COMPLETING STEPS 1-11





EXAMPLES OF A REHABILITATED CULVERTS AFTER COMPLETING STEPS 1-11





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NOSE CONE CONSTRUCTION

CREATING A NOSE CONE

Follow the below steps and figures to create a nose cone with 8 connection points on the end of a piece of pipe.

- Step (1) Determine X and L (minimum). X=πd/8 and L=d/2 where d = pipe outside diameter. For 16" and smaller pipes, L can be equal to the diameter. (Refer to Figure 4-1 and Figure 4-2 on next page)
- Step (2) Mark a line all the way around the pipe OD at L distance from end.
- Step (3) Mark top dead center (TDC) on pipe at end and at L distance from end.
- Step (4) Starting at TDC, mark every X distance around the pipe OD at the line made L distance from the end. (See figure 4-1)
- Step (5) Starting at X/2 from TDC, mark every X distance around the pipe at the end of the pipe.
- Step (6) Connect the marks from end of pipe and L distance to create the triangles to be cut out. (See figure 4-2)
- Step (7) Drill holes near the point at the pipe end. Holes will be dictated by wire rope size and flexibility. (See figure 4-2)
- **Step** (8) Cut out triangle shapes from end of pipe. (See figure 4-2 and 4-3)
- Step (9) Draw points together to create cone shape. (See figure 4-4)



FIGURE 4-1 PIPE OD UNROLLED FOR VISUAL



FIGURE 4-2





FIGURE 4-3 LINER AFTER CUTS







FIGURE 4-4 NOSE CONE DURING FORMING





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OVAL PIPE RECOMMENDATIONS

INSTALLATION: BRACING AND JOINT COMPLETITION

The creation of the oval Snap-Tite[®] is accomplished through controlled deformation and factory installed bracing to maintain the shape of the product until the liner pipe has been fully installed. Round Snap-Tite is put in a hydraulic press machine and deflected down, in a controlled manner, to the design dimensions. The ends of the polyethylene pipe are also affected by a stress relief reaction of "toe-in" or neck down. This stress relief reaction naturally occurs in plain HDPE pipe ends and is further exacerbated by removing material in the machining process to create the male and female profiles for connection. The combined stresses of deflection (ovalization) and machining, along with the viscoelastic nature of polyethylene pipe, can occasionally result in irregular shaped oval Snap-Tite ends, which may be a little out of balance or "fish-mouthed".



The oval pipe will be delivered with a horizontal strut grid throughout the entire length of the pipe. A vertical strut (I-beams) will be provided at the female end of the pipe, and may also be installed at the male end in some situations. The vertical struts are installed at the plant to prevent further "fish-mouthing" while the oval Snap-Tite awaits shipment to the project location. Removal of the vertical struts is not recommended until the joints are ready to be snapped together.The horizontal struts should NOT be removed until the entire liner is installed and grouted into place.



Removal of vertical struts at pipe ends should be done with great care. Rebound energy could be exerted by the pipe ends on the vertical strut to force it out during removal.

Insert the gasket into the first groove of the male end prior to pushing the joint together. Refer to Step 6 on page 35 for detailed instructions and illustrations. The use of sealing compounds like mastic or silicone may be allowed to assist in sealing at the joints. The use of sealing compounds may be necessary in situations like excessive deformations from storage or cold weather, where the pliable nature of the joint is challenged.

To complete the Snap-Tite oval joint, you may need additional tools to help the irregular ends line up. Contractors have successfully utilized crow bars to get the female joint worked around the male joint. Once the joint is started, the male joint should firm up the female joint. Since the polyethylene material is ductile and flexible, especially at warmer temperatures, sitting in the sun and/or the use of a heat blanket may also help the pipe become more "pliable" and allow the joint to complete easier.

NOTE: A 'weed burner' or any other flame device is NOT recommended to heat the pipe due to the risk of localized damage like melting or blistering, much like a candle. HDPE materials or sealing compounds may burn with prolonged exposure to open flame.





Removal of internal braces of the Snap-Tite[®] liner prior to insertion into the host pipe and completion of grouting is not recommended and should be avoided.

Without external restraint, removing some of the bracing material can release stored energy and a spring-like rebound of the pipe to a more circular shape (nearly round) condition is expected. Also, removal of internal bracing prior to grouting can damage grout tubes or any blocking/spacers that have been installed in the host pipe to prevent buoyant forces. Removal of bracing may also restrict the flow of grout that can pass between the HDPE liner and the host pipe. Cured grout around the encapsulated pipe will stabilize and manage the forces after removal of bracing.



OVAL PIPE GROUTING

Chapter 7 of the Snap-Tite Design Manual has extensive information and recommendations, but key elements related to oval pipe are identified here.

The use of low-density cellular grouts are recommended and should be placed in the annulus between the host pipe and liner pipe prior to removing bracing. Grout pressures present on the oval liner product should be limited to 2 psi or less during grout placement. Excessive grout pressures placed on an oval pipe may increase the risk for pipe buckling, especially at the invert of the pipe where bracing may not be present.

Grouting in lifts is also considered a prudent approach to limit excessive grout pressures. Grouting of the HDPE liner pipe will reduce some of the compressive forces on the internal bracing, while also stabilizing the liner pipe, allowing for less resistance during removal.

OVAL PIPE HANDLING AND STORAGE

Pages 3-10 have extensive information and recommendations, but additional elements are identified here.

While oval pipe may have been stacked for shipping, it is recommended not to stack oval pipes on site, to prevent further deflection and loading on bracing. Oval pipes should be laid straight, not crossing over or entangled with each other. Movement, rolling, or shifting of oval pipe is less likely than round pipe, but blocking is still recommended.



Supports and cribbing from the shipment of the oval pipe is recommended to assist with site storage upon unloading.



FIBERGLASS HYDRO-BELL INSTALLATION

STANDARD INSTALLATION

The plain end of the Hydro-Bell is designed to fit into the Female End of Snap-Tite[®] pipe. The Hydro-Bell has the same ID as the Snap-Tite pipe, but the end of the Hydro-Bell has an OD that is smaller than the ID of the Female Snap-Tite end. When the Hydro-Bell is slid into the female end (similar to a male Snap-Tite would but without any ridges for interlocking) and it will butt up to the machined stop at the end of the female section. The Seal Tite rubber coupling will slide over the female HDPE pipe end and should rest on the raised portion of the fiberglass body. Each end of the rubber coupling is clamped using the worm drive clamps provided with the coupling. Additional installation details are available for different backfill and headwall arrangements are available from your local Snap-Tite representative.

FIGURE 6-1



NON-STANDARD INSTALLATION

When it is not possible to connect to a Snap-Tite female end, it is possible to connect to a plain end of HDPE pipe. The plain end of the Hydro Bell will butt up against any plain cut HDPE pipe, but the wall thicknesses on the two products are different which will result in a mismatch between each OD. If a male end of HDPE is presented for connection, it should be cut back until the solid wall is presented with a square cut. A special adaptor collar can be provided to adapt to plain end pipes but advance planning should identify the need for this adapter for verification of pipe dimensions.





CUTTING AND SHAPING THE HYDRO-BELL FOR CUSTOMIZED INLET

The Hydro-Bell is provided with an extended flat face that can be used as an attachment point for existing headwalls, with equally space holes in the corners to assist in marking and drilling pilot holes. There are also reference lines for ease of cutting to final shape requirements. A circular indention mark is made at the round to flat transition for removal of the flat face. if desired. Two horizontal lines are provided at the bottom to assist in making a square cut so that the bottom of the Hvdro-Bell may rest at a lower point. The bottommost line helps to locate the round entry at the lowest point. Above that is a line that can be used to remove all material below the invert of the Hydro-Bell and piping system. Removal of material along the bottom of the Hvdro-Bell is expected to have a negligible effect on flow as the Hydro-Bell is most efficient when water increase above to top of the round entry.



FIGURE 6-5

INDENTATION LINE AT INVERT TO ASSIST IN FIELD REMOVAL OF LOWER SECTION, IF REQUIRED

FIELD CUT AT BOTTOM OF ROUND/SQUARE TRANSITION
SnapTite

HYDRO-BELL GROUTING AND FINISHING

The extended flat face of the Hydro-Bell can also be used as one edge of a form to finish the entrance preparation with a concrete headwall. Plan accordingly to arrange for vent and grout tubes, as allowances may need to be considered. Ensure that grout can enter the annular space through the bulkhead. Be sure that the connection to the female end of the Snap-Tite is encased in the headwall, bulkhead, or grouted annulus.



Ideally, the Hydro-Bell is flush with an existing headwall or is part of the new headwall such that water is entering the pipe at the highest efficiency. When possible, place fill behind the Hydro-Bell so the there is no space for water to get behind the top and sides of the Hydro-Bell face before entering the pipe. This may not always be possible to construct. Consult your local Snap-Tite representative or the website for more installation and connection detail examples.





HYDRO-BELL ENVIRONMENTAL RESISTANCE

The Hydro-Bell has carbon black added for UV resistance. No degradation is expected for long-term exposure to sunlight. Additionally, the fiberglass Hydro-Bell is flame resistant to grass and brush fires with a flame spread rating of less than 25 when tested in accordance to ASTM E 84. The body is made with a Hexion 755-8590 corrosion resistant vinyl ester resin or equal.



HYDRO-BELL HANDLING AND STORAGE

Pages 3-10 have extensive information and recommendations, but additional elements are identified here.

Do not stack anything on the Hydro-Bell at any time during transportation or site storage. Supports/dunnage may be used to maintain clearance for forklift forks or lifting slings.Take care to insure no direct impacts against other surfaces or dropping on the ground.





TABLE 6-1 SIZE AND DIMENSION REFERENCE CHART

FIBERGLASS HYDRO-BELL DIMENSIONS									
Pipe OD (In)	ID (in)	A (in)	B (in)	C (in)	D (in)				
10.75	10.05	13.8	9	14.9	14.9				
14	13.09	19.5	13.43	21.35	21.35				
16	14.95	22.5	15.3	24.4	24.4				
18	16.83	23.5	17.25	25.5	25.5				
20	18.7	27.9	18.34	29.9	29.9				
22	20.57	30	19.6	32	32				
24	22.43	33.5	22	35.5	35.5				
28	26.17	36.1	20.8	38.1	38.1				
30	28.04	40.5	23.21	42.5	42.5				
32	29.91	42	24.71	44.97	44.97				
36	33.65	47.5	28	49.8	49.8				
42	39.26	55	33.8	57.8	58.1				
48	44.87	30	36	63.1	63.1				
54	50.48	63	42.8	68	68				
63	58.88	76	40.45	80	80				





FIBERGLASS HYDRO-BELL DIMENSIONS									
F (in)	G (in)	H (in)	J (in)	K (in)	M (in)	Pipe OD (In)			
0.13	0.62	0.04	0.83	2.5	0.5	10.75			
0.13	0.75	0.05	1.45	4.18	1	14			
0.15	0.75	0.05	1.4	4.69	0.95	16			
0.17	0.75	0.05	2	4.3	1	18			
0.19	0.75	0.05	2	5.57	1	20			
0.207	0.75	0.05	2	5.7	1	22			
0.375	1.5	0.1	2	3.6	1	24			
0.14	1.5	0.1	2	6.1	1	28			
0.17	1.5	0.1	2	7.15	1	30			
0.2	1.5	0.1	2	7.48	1.5	32			
0.2	1.8	0.12	2	8	1.1	36			
0.375	2.4	0.16	3.3	8.8	1.7	42			
0.2	2.42	0.16	3	9	1.5	48			
0.31	3.16	0.22	4	8.6	2.5	54			
0.31	3.16	0.22	4	10.4	2	63			





THE SNAP-TITE® SOLUTION

Meets AASHTO Standard M326 for rehabilitating culverts.

• Flexibility to insert into misaligned concrete or rusted partially collapsed corrugated metal pipe.

• Tough, but thin, sidewall to give the highest flows possible after lining. The SnapTite joint makes a solid mechanical connection that can be pushed or pulled.



THREAD LINER INSTALLATION

STANDARD INSTALLATION

Thread-Liner pipe is provided with a male and female end on each section of pipe. One full revolution of the pipe will completely tighten one section of the pipe to the next. A matching chamfer on each mating piece will typically provide a tightened or locking engagement of the pieces.

Start with a counter-clockwise movement of the pipe till an audible thump is heard, typically no more than one quarter turn. Cross threading is a primary concern with getting started and the initial counter clockwise movement typically drops the male and female sections into the beginning engagement thread simultaneously. This action should help the alignment of the threads to a straight alignment position. Visually check for axial alignment of the two pipe sections at intervals around the circumference of the pipe.

THREAD SEALANT

Thread-Liner pipe is made by creating a male and female thread on the HDPE pipe. Those threads have a loose engagement to allow some rotation. It is not expected that the threads will create a liquid tight seal on their own. It is recommended to apply a thread sealant or a silicone caulk to the threaded sections, especially heavy at the ends where the chamfer engagement occurs. Thread sealants are not expected to create a pressure rated seal but will keep grout from bypassing the joints till setting up and keeping the effluent from escaping the pipe.

SnapTite

TOOLS

Wraparound nylon strap wrenches are the preferred tool to rotate the pipe in the threading process. Depending on the size of the Thread-Liner pipe, heavy equipment and straps to hold the pipe at the proper elevation may be needed.

Creativity may be the key to finding the right approach, especially as the size of the pipe increases. Attached are photos of a tool (a two prong bar wrench may be the best description)



that can be used to help provide torque at the end of the pipe assuming there is enough clearance. The two bars must have a separation larger than the wall thickness of the pipe and extend past the male or female sections of the pipe, and designed not to press or cut into machined end portions, so as not to damage the plastic threads.





THREAD-LINER ENVIRONMENTAL RESISTANCE

Thread-Liner pipe has carbon black added for UV resistance. No degradation is expected for long-term exposure to sunlight.

THREAD-LINER HANDLING AND STORAGE

Pages 3-10 have extensive information and recommendations, but additional elements are identified here.

Take special care to protect from any damage to the threaded ends of pipe. The storage site should relatively smooth, flat, level surface free of stones, debris, or other material that could damage pipe or components, or interfere with handling. Supports/dunnage may be used to maintain clearance for forklift forks or lifting slings. Take care to insure no direct impacts occur against pipe and other surfaces, nor should the pipe be dropped on the ground.





Scan here to view more Snap-Tite literature.



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