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Contract Documents

Newberry County Capital Sales Tax Project No. 6 Ten Water Point Locations For The Consolidated Fire District

Newberry County, South Carolina

July 31, 2019

Table of Contents

SECTION 00 00 00
PURCHASING GENERAL CONTRACT PROVISIONS

COUNTY OF NEWBERRY
Purchasing Department, Post Office Box 156, Newberry, SC 29108
Ph: (803) 321-2100 / Fax: (803) 321-2102

INVITATION FOR BIDS

BID NUMBER: 2019-13

DATE: August 9th , 2019

PRE-BID MEETING: Wednesday, August 21st, 2019 @ 3:00 p.m. Newberry County Courthouse Annex, 1309 College Street, Newberry SC 29108

OPENING DATE AND TIME: Wednesday, September 11th, 2019 @ 3:00 p.m. Newberry County Courthouse Annex, 1309 College Street, Newberry, SC 29108

SUBMITTAL ADDRESS: Newberry County Courthouse Annex, 1309 College Street, Newberry (Hand Delivered)
Post Office Box 156, Newberry SC 29108
(US Postal Service Delivered)

PROCUREMENT FOR: Newberry County Capital Sales Tax Project No.6 Ten Water Point Locations for the Consolidated Fire District

Subject to the conditions, provisions and the enclosed specifications, sealed bids will be received at this office until the stated date and time and then publicly opened. Any bid received after the scheduled deadline, will be immediately disqualified. The County assumes no responsibility for the delivery of bids which are mailed. BID NUMBER MUST BE SHOWN ON THE OUTSIDE OF ENVELOPE.

DIRECT ALL INQUIRIES TO:

Crystal Waldrop, CPPB
Purchasing Director
Post Office Box 156

NOTICE TO BIDDERS: Each bidder shall fully acquaint himself with conditions relating to the scope and restrictions attending the execution of the work under the conditions of this bid. The failure or omission of a bidder to acquaint himself with existing conditions shall in no way relieve him of any obligation with respect to this bid. All amendments to and interpretations of this solicitation shall be in writing and issued by the Purchasing Director of the County. Newberry County shall not be legally bound by an amendment or interpretation that is not in writing.

COUNTY OF NEWBERRY
Purchasing Office, 1309 College Street, Post Office Box 156, Newberry S.C. 29108
Ph: (803) 321-2100 / Fax: (803) 321-2102

BIDDERS SCHEDULE

BID NUMBER: 2019-13 **DATE: August 9th, 2019**

OPENING DATE AND TIME: **Wednesday, September 11th, 2019 @ 3:00 p.m.**

OPENING LOCATION: Newberry County Courthouse Annex, Conference Room
1309 College Street
Newberry, SC 29108

PROCUREMENT: Newberry County Capital Sales Tax Project No.6 for the Consolidated Fire District.

Base Bid **$**_____

***Bids shall be good for forty-five (45) days from the date of submittal**

VENDOR: _____ **SIGNATURE:** _____

Name of Authorized Contact: _____

Email Address: _____

Address: _____

Phone & Fax: _____

FEIN: _____

Contractor's SC License #: _____

INSTRUCTIONS TO BIDDERS

1. Only one copy of bid is required unless otherwise specified.

2. Bids, amendments thereto or withdrawal request must be received by the time advertised for bid openings to be timely filed. It is the vendor's sole responsibility to insure that these documents are received by the purchasing office at the time indicated in the bid document.

PLEASE NOTE THE VENDOR IS ULTIMATELY RESPONSIBLE FOR VERIFYING THEY HAVE RECEIVED ANY/ALL ADDENDA PRIOR TO THE BID OPENING.

3. When specifications or descriptive papers are submitted with the bid, enter bidder's name thereon.

4. Submit your signed bid on the bidder's schedule provided. Show bid number on envelope as instructed and the bid name or description. Newberry County accepts no responsibility for unmarked or improperly marked envelopes.

5. Bidders must clearly mark as "Confidential" each part of their bid which they consider to be proprietary information that could be exempt from disclosure under Section 30-4-40 Code of Laws of South Carolina, 1976, as amended, (also known as the Freedom of Information Act). The County reserves the right to determine whether this information should be exempt from disclosure and no legal action may be brought against the County or its agents for its determination in this regard.

6. By submission of a bid, you are guaranteeing that all goods and services meet the requirements of the solicitation during the contract period.

7. Tie bids will be resolved in accordance with the provisions of the Newberry County Purchasing Ordinance.

8. A copy of the bidder's W-9 shall be included in the submission.

GENERAL PROVISIONS

1. The County of Newberry reserves the right to reject any and all bids, to cancel a solicitation, and to waive any technicality if deemed to be in the best interest of the County.

2. Unit prices will govern over extended prices unless otherwise stated in this bid invitation.

3. **PROHIBITION OF GRATUITIES:** South Carolina law and the Newberry County Purchasing Ordinance prohibit the giving of anything of value in return for favors or

other preferential treatment in the purchasing process. Bidders should govern themselves accordingly.

4. **BIDDERS QUALIFICATION:** Bidders must, upon request of the county, furnish satisfactory evidence of their ability to furnish products or services in accordance with the terms and conditions of these specifications. The County reserves the right to make the final determination as to the bidder's ability to provide the products or services requested herein. Bidder determined to be irresponsible bidders are not allowed to bid to provide the County goods or services.

5. **BIDDERS RESPONSIBILITY:** Each bidder shall fully acquaint himself with conditions relating to the scope and restrictions attending the execution of the work under the conditions of this bid. It is expected that this will sometimes require on-site observation. The failure or omission of a bidder to acquaint himself with existing conditions shall in no way relieve him of any obligation with respect to this bid or to the contract.

6. **AWARD CRITERIA:** The contract shall be awarded to the lowest responsible and responsive bidder(s) whose bid meets the requirements and criteria set forth in the Invitation for Bid. Award may be made to one or a multiple of bidders, whichever deems to be in the best interest of the County, or unless otherwise stated on the bidder's schedule.

7. **WAIVER:** The County reserves the right to waive any Instruction to Bidders, General or Special Provisions, General or Special Conditions, or specifications deviation if deemed to be in the best interest of the county.

8. **COMPETITION:** This solicitation is intended to promote competition. If any language, specifications, terms and conditions, or any combination thereof restricts or limits the requirements in this solicitation to a single source, it shall be the responsibility of the interested vendor to notify the Purchasing Director on in writing within five (5) days prior to the opening date. The solicitation may or may not be changed but a review of such notification will be made prior to the award.

9. **REJECTION:** Ambiguous bids which are uncertain as to terms, delivery, quantity, or compliance with specifications may be rejected or otherwise disregarded if such action is in the best interest of the County.

10. **RIGHT TO PROTEST**: Any prospective bidder, offeror, or contractor, who is aggrieved in connection with the solicitation of a contract shall protest in writing to the Purchasing Director within ten (10) calendar days of the date of issuance of the Invitation to Bid or other solicitation documents, whichever is applicable, or any amendment thereto, if the amendment is at issue. Any actual bidder, offeror, or contractor, who is aggrieved in connection with the intended award or award of a contract, shall protest in

writing to the purchasing director within ten (10) calendar days of the notification of intent to award or statement of award.

11. **PROTEST PROCEDURE:** A protest shall be in writing, submitted to the purchasing director, and shall set forth the specific grounds of the protest with enough particularity to give notice to the issues to be decided.

GENERAL CONDITIONS

1. **DEFAULT:** In case of default by the contractor, the County reserves the right to purchase any or all items in default in the open market, charging the contractor with any excessive costs. Should such charge be assessed, no subsequent bids of the defaulting contractor will be considered until the assessed charge has been satisfied.

2. **NON-APPROPRIATION:** Any contract entered into by the County resulting from this bid invitation shall be subject to cancellation without damages or further obligation when funds are not appropriated or otherwise made available to support continuation of performance in a subsequent fiscal period or appropriated year.

3. **HOLD HARMLESS AND INSURANCE**: The successful bidder shall indemnify and hold harmless the County of Newberry and all County officers, agents and employees against all suits or claims for personal injury or property damage resulting from, or arising from, the successful bidder's performance of the contract, as well as against any suits or claims of any character brought against the County or its agents or employees by reason of any claim of infringement of any patent, trade mark, trade dress, or copyright, including reimbursement to the County for all attorney's fees and court costs incurred by the County in defending itself or its agents or employees against any such claim or suit. **In addition, the successful bidder will maintain a public liability policy with minimum limits of $1,000,000 per occurrence, or $2,000,000 single limit, for damages arising from acts which occur during the contract period, with the County of Newberry named as an additional insured on the policy; the successful bidder shall also maintain workers compensation and vehicle liability insurance in the amounts required by statutory law.** Proof of such coverage will be provided upon demand or as otherwise provided in the bid specifications.

4. **CONTRACT ADMINISTRATION:** Questions or problems arising after award of this contract shall be directed to the Purchasing Director, P.O. Box 156, Newberry, SC 29108, or by calling 803-321-2100.

5. **FORCE MAJEURE:** The Contractor shall not be liable for any excess costs if the failure to perform the contract arises out of causes beyond the control and without fault or negligence of the contractor. Such causes may include, but are not restricted to acts of

God or of a public enemy, acts of Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather; but in every case the failure to perform must be beyond the control and without the fault or negligence of the contractor. If the failure to perform is caused by default of a subcontractor, and if such default arises out of causes beyond the control of both the contractor and subcontractor and without excess costs for failure to perform, unless the supplies or services to be furnished by the subcontractor were obtainable from other sources in sufficient time to permit the contractor to meet the required delivery schedule.

6. **PUBLIC RELEASE:** Contractor agrees not to refer to award of this contract in commercial advertising in such a manner as to state or imply that the products or services provided are endorsed or preferred by the User.

7. **QUALITY OF PRODUCT:** Unless otherwise indicated in this bid it is understood and agreed that any items offered or shipped on this bid shall be new, in first class condition, and without defect that all containers shall be new and suitable for storage or shipment, and that prices include standard commercial packaging and shipping to the specified destination in Newberry County. No demonstration models shall be sold as new, without prior written permission of the County.

8. **S.C. LAW CLAUSE:** Upon award of a contract under this bid, the person, partnership, association or corporation to whom the award is made must comply with the laws of South Carolina which require such person or entity to be authorized and/or licensed to do business with this State. Notwithstanding the fact that applicable statutes may exempt or exclude the successful bidder from requirements that it be authorized and/or licensed to do business in this State, by submission of this signed bid, the bidder agrees to subject himself to the jurisdiction and process of the courts of the State of South Carolina as to all matters and disputes arising or to arise under the contract and the performance thereof, including any questions as to the liability for taxes, licenses, or fees levied by the State.

9. **ASSIGNMENT:** No contract or its Provisions may be assigned, sublet, or transferred without the written consent of the Purchasing Director.

10. **AFFIRMATIVE ACTION:** The successful bidder will take affirmative action in complying with all Federal and State requirements concerning fair employment of the handicapped, and concerning the treatment of all employees, without regard or discrimination by reason of race, color, religion, sex, national origin or physical handicap.

11. **DELIVERIES:** All deliveries shall be FOB Destination. It is agreed by the parties hereto that delivery by the contractor to the common carrier does not constitute delivery to the County. Any claim for loss or damage shall be between the contractor and the carrier.

12. **APPROPRIATE S.C. SALES TAXES, FEES AND PERMITS** shall be included in the Contractor's base bid for all materials. All fees, including permits and any removal or disposal of construction debris shall be included in the contractor's bid.

13. **PAYMENT TERMS:** Payment will be made when all work is completed and accepted by Newberry County as meeting the specifications here within.

14. **BID BOND:** For each bid in excess of $25,000.00 each bidder will submit with their bid a bond in the amount of 5% of the total price of the bid submitted. The bid bonds will be returned to the unsuccessful bidders once the county accepts the lowest most responsive bid. If the most responsive bidder fails to perform the responsibility of the bid within 10 days of the award, then the bid bond will be forfeited to the county as liquidated damages and the next lowest bidder will be awarded the bid. Bid bonds may be in the form of a surety, a cashier's check or an unconditional letter of credit in favor of Newberry County issued by a commercial bank in South Carolina.

15. **PERFORMANCE AND PAYMENT BONDS:** The chosen vendor will be required to submit to the County both a performance bond and payment bond in the amount of 100% of the contract price before commencing with the work. **Both bonds will be issued from a surety company with an "A" minimum rating of performance as stated in the most current publication of Best Key Rating Guide, Property Liability.**

16. **Compliance with The South Carolina Illegal Immigration Act**: By submitting an offer, Bidder certifies that it will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina code of Laws (originally enacted as Section 3 of The South Carolina Illegal Immigration act, 2008 S.C. Act No. 280) and agrees to provide upon request any documentation required to establish either: (a) the applicability of Title 8, Chapter 14 to Bidder and any subcontractor or sub-subcontractors; or (b) the compliance with Title 8, Chapter 14 by Bidder and any subcontractors or sub-subcontractors. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both". Bidder agrees to include in any contracts with its subcontractors language requiring the subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in any contracts with the sub-subcontractors language requiring the sub-subcontract to comply with the applicable requirements of Title 8, Chapter 14.

SECTION 00 41 13

BID FORM

COUNTY OF NEWBERRY, SOUTH CAROLINA
PROJECT BID NO. 2019-13
NEWBERRY COUNTY CAPITAL SALES TAX
PROJECT NO.6
TEN WATER POINT LOCATIONS FOR THE CONSOLIDATED FIRE DISTRICT

TABLE OF CONTENTS

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

County of Newberry

1309 College Street PO Box 156

Newberry, SC 29108

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

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for **45 days** after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

2.02 BIDDER will sign and deliver the required number of counterparts of the AGREEMENT with the Bonds and other documents required by the Bidding Requirements within {15} days after the date of OWNER's Notice of Award.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum, Date
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site(s), conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "Coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

ARTICLE 5 – BASIS OF BID

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

Item No.	Description	Unit	Bid Price
1	SITE 1 – U.S. Route 176 TMS# 382-17	LS	
2	SITE 2 – 166 Tyger River Road TMS# 546-27	LS	
3	SITE 3 – 1163 Leitzsey Road TMS #684-26	LS	
4	SITE 4 – 3464 Highway 34 TMS# 615-10	LS	
5	SITE 5 – 10671 Broad River Road (Recycling Center) TMS# 673-18	LS	
6	SITE 6 – 6167 Brazelmans Bridge Rd TMS# 486-4	LS	
7	SITE 7 – 4126 Mt. Pleasant Road TMS# 553-2	LS	
8	SITE 8 – 5725 Dogwalla Rd TMS# 603-5	LS	
9	SITE 10 – 15804 U.S. Route 176 TMS# 442-1	LS	
	Total		

Total Lump Sum Construction Costs $_____

****The above referenced TOTAL Lump Sum Construction Cost is to be entered on the County of Newberry BIDDERS SCHEDULE As the BASE BID AMOUNT FOR THIS CONTRACT.**

5.02 Bid Alternates:

A. Bid Alternate No. 1. – Newberry County may elect for the placement of asphalt paving in lieu of gravel driveways at Sites 2 & 10 in accordance with the plan details. Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
No. 57 Stone (Deduct)	CY	43		
Geotextile Underlayment – (Class 2) Type C	SY	271		
Asphalt Paving	SY	271		
		Total	**$**	

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2)

estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents. The owner **(Newberry County) reserves the right to award the entire contract or a portion of the contract based on available funding for this project.**

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with the County of Newberry General Provisions , General Conditions and the Standard General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

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

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. List of Project References;

E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

F. Contractor's License No.: _____ **[or]** Evidence of Bidder's ability to obtain a State Contractor's License and a covenant by Bidder to obtain said license within the time for acceptance of Bids;

G. Required Bidder Qualification Statement with supporting data; and

7.03 Other Requirements

ARTICLE 8 – DEFINED TERMS

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

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

Bidder's License No.: _____
(where applicable)

END OF SECTION

SECTION 00 45 19

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____)
County of_____)

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

(1) He is _____ of _____, the Bidder that has submitted the attached Bid;

(2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

(3) Such Bid is genuine and is not a sham Bid.

(4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, conveyance or unlawful agreement any advantage against Newberry County, South Carolina or any person interested in the proposed contract:

(5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representative, owners, employees, or parties in interest, including this affiant.

(Signed)_____

_____
(Title)

Subscribed and sworn to before me

This_____ day of _____, 20___

_____

_____
(Title)

My commission expires_____

SECTION 00 52 13

AGREEMENT

BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between The County of Newberry, South Carolina ("Owner") and

("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

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

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Bid Number 2019-13 Newberry County Capital Sales Tax Project No.6 Ten Water Point Locations for the Consolidated Fire District. The project includes site work at nine (9) locations throughout Newberry County.

ARTICLE 3 – ENGINEER

3.01 The part of the Project that pertains to the Work has been designed by HDR|ICA.

3.02 The Owner has retained HDR|ICA ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

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

4.02 *Contract Times: Days*

A. The Work will be substantially completed within **200 calendar** days after the date when the Contract Times commence to run as provided in the Notice to proceed. Completed and ready for final payment in accordance with Paragraph 13 of the General Conditions.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of

requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $1,500.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

ARTICLE 5 – PAYMENT PROCEDURES

5.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Paragraph 5.02 below.

5.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 15th day of each month during performance of the Work as provided in Paragraph 5.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract

a. 90% percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer. At the discretion of the Owner/Engineer, retainage may be reduced to 5%; and

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

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 95 % (percent) of the Work completed, less such amounts set off by Owner, and less 100 %_percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

5.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 13 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 13.

ARTICLE 6 – INTEREST

6.01 All amounts not paid when due shall bear interest at the rate of **0 %** percent per annum.

ARTICLE 7 – CONTRACTOR'S REPRESENTATIONS

7.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

B. Contractor has visited the Sites, conducted a thorough, alert visual examination of the Sites and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Site-related reports and drawings identified in the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

F. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

H. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

J. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 8 – CONTRACT DOCUMENTS

8.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 6, inclusive).
2. Performance bond (pages 1 to 3 inclusive).
3. Payment bond (pages 1 to 3 inclusive).
4. Other bonds.
    a. Inclusive.
5. General Conditions (pages, inclusive).
6. Specifications as listed in the table of contents of the Project Manual.
7. Drawings (not attached but incorporated by reference) consisting of 24 sheets with each sheet bearing the following general title: **Newberry County Capital Sales Tax Project No.6 Ten Water Point Locations for the Consolidated Fire District.**
8. Addenda (numbers {___} to {___}, inclusive).
9. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid (pages {___} to {___}, inclusive).
10. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.

B. The documents listed in Paragraph 8.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 8.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 9 – MISCELLANEOUS

9.01 *Terms*

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

9.02 *Assignment of Contract*

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

9.03 *Successors and Assigns*

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

9.04 *Severability*

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

9.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 9.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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

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

OWNER:	CONTRACTOR:
_____	_____
By: _____	By: _____
Title: _____	Title: _____
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____	Attest: _____
Title: _____	Title: _____
Address for giving notices:	Address for giving notices:
_____	_____
_____	_____
_____	_____
	License No.: _____ *(where applicable)*

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

NOTE TO USER: Use in those states or other jurisdictions where applicable or required.

END OF SECTION

SECTION 00 61 13
PERFORMANCE BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

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

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

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

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 when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. 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;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven 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 Paragraph 5.4, and the Owner refuses the payment 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.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 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 5; and

7.3 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.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

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 this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

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

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

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

16. Modifications to this Bond are as follows:

SECTION 00 62 14

PAYMENT BOND

CONTRACTOR *(name and address)*:

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

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND

Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

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

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(seal)*	_____ *(seal)*
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	**By:** _____
Signature	Signature *(attach power of attorney)*
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	**Attest:** _____
Signature	Signature
_____	_____
Title	Title

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

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

   5.1 Claimants who do not have a direct contract with the Contractor,

      5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

   given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2 Pay or arrange for payment of any undisputed amounts.

   7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and

Claimant for labor, materials, or equipment furnished as of the date of the Claim.

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

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

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

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

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

18. Modifications to this Bond are as follows:

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. General:
1. Furnish all labor, materials, tools, equipment and services as indicated on the drawings and in accordance with the specifications and the Tank manufactures installation requirements.
2. Although such Work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation.

1.2 WORK COVERED BY CONTRACT

A. The Work of this Contract generally includes, but is not limited to, the following:
1. Furnish and Install ten (10) 40,000 gallon underground Fiberglass – Reinforced Plastic Tanks at Multiple Sites throughout Newberry County; with all accessories with approximate dimensions of 10' diameter, 69'-2" long.
2. Concrete (4'x10'x 6" thick) slabs over the tank risers, hydrant assemblies, protection bollards, manways, and refill and suction lines.
3. Install anchor straps and concrete deadman anchors poured on site.
4. Relocate & protect various underground utilities as required.
5. Pavement and Fiberglass Reinforced Concrete driveway repairs or new installation.
6. Miscellaneous work as may be required, including but not limited to: erosion control, restoring site to pre-construction conditions, etc.

1.3 WORK SEQUENCE

A. The CONTRACTOR shall develop a schedule for completing the work and notify the OWNER and Engineer.

B. The CONTRACTOR shall organize and plan the construction activities to assure the safety and reliability of and to minimize the interruption to other utilities.

C. The CONTRACTOR must allow and provide for the OWNER'S continuous access to site.

D. All existing facilities will remain in operation during construction.

E. Any existing utilities, equipment, County facilities, and appurtenances such as water lines, gas lines, electrical cables, Refuse/recycling centers, Fire Stations, Churches, structures, vehicles, etc., which are damaged by the CONTRACTOR during construction, even though inadvertently, will be repaired immediately by CONTRACTOR at his own expense.

F. CONTRACTOR shall conduct all Work during regular working hours, which are defined as weekdays, 7:30 a.m. to 6:00 p.m., holidays excluded, except where restricted by the SCDOT Encroachment Permit and or County Facilities Operations and the Private Property Owner's use of the site.

G. The Contractor may apply to work outside of regular working hours upon receiving permission in writing from the Owners of the property.

1.4 EASEMENTS AND RIGHTS-OF-WAY

A. Confine construction operations to the immediate vicinity of the location indicated on Drawings and use due care in placing construction tools, equipment, excavated materials, and FRP tank materials and supplies, so as to cause the least possible damage to property and interference with traffic.

B. Do not close highways, streets, or roads without first obtaining permission from the proper authorities. Notify OWNER before any roadway is blocked.

1.5 BARRICADES AND LIGHTS

A. Protect streets and roads that are closed to traffic by effective barricades with acceptable warning signs as approved by the authority having jurisdiction.

B. Provide suitable barriers, signs, and lights, including construction fencing around the work area, to the extent required to adequately protect the public.

C. Provide suitable warning signs and lights at obstructions, such as material piles and equipment.

D. Illuminate barricades and obstructions with warning lights from sunset to sunrise.

E. Install and maintain barricades, signs, lights, and other protective devices in conformity with applicable laws and regulations, and where within highway rights-of-way, as required by the authority having jurisdiction.

1.6 FENCES

A. Maintain all fences affected by the Work until completion of the Work.

B. Keep gates closed and locked when not in use.

C. At the completion of Work, restore fences to their original preconstruction condition and to their original location.

1.7 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by construction operations.

B. Restore to their original condition, pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with sod and shrubs, in yards and parking areas, whether within or outside the easement.

C. Replace highway signs removed due to construction as soon as conditions that necessitated removal have been cleared. Stop signs shall be replaced at the end of each work day. Traffic control shall be provided where necessary to temporarily remove stop signs.

D. Use new materials for replacements of all items.

E. CONTRACTOR shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, that may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by CONTRACTOR or CONTRACTOR's subcontractors or suppliers.

F. Make satisfactory and acceptable arrangements with the OWNER of, or the agency or authority having jurisdiction over, any damaged property concerning its repair, replacement, or payment of costs incurred in connection with the damage.

G. Keep fire hydrants and valves free from obstruction and available for use at all times.

H. In areas where the CONTRACTOR's operations are adjacent to or near a utility and such operations may cause damage which might result in considerable expense, loss, and inconvenience, the operation shall be suspended until all arrangements necessary for the protection thereof have been made by the CONTRACTOR.

I. Notify all utility offices which may be affected by the construction operation at least 48 hours in advance. Before exposing any utility, the utility having jurisdiction shall grant permission and may oversee the operation. Should service of any utility be interrupted due to the CONTRACTOR's operation, the proper authority shall be notified immediately. CONTRACTOR shall cooperate with the said authority in restoring the service as promptly as possible and shall bear any costs incurred.

1.8 LINES AND GRADES

A. Construct all Work to the lines, grades, and elevations indicated on the Drawings.
   1. Remove and reconstruct improperly located Work.

1.9 REGULATORY REQUIREMENTS

A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work, including but not limited to, OSHA excavation requirements.

B. References in the Contract Documents to local codes shall mean County of Newberry, South Carolina.

C. Other standards and codes that apply to the Work are designated in the Specifications.

1.10 ACCESS BY OWNER AND GOVERNMENT OFFICIALS

A. Authorized representatives of OWNER and of governmental agencies shall at all times have access to the Work where it is in preparation or progress. CONTRACTOR shall provide proper facilities for access and inspection.

1.11 CONTRACTOR'S USE OF PREMISES

A. CONTRACTOR shall limit his use of the premises for work and storage.

B. Confine operations to areas within the immediate vicinity of the work site.

C. Coordinate use of premises with Property Owner.
   1. Newberry County Fire Station Sites – Contact Tommy Long, Emergency Services Coordinator (803) 405-7766.
   2. Newberry County Waste Transfer Site – Michael Pisano, Director of Public Works (803) 321-2180
   3. Private Property – Contact Property Owners

D. CONTRACTOR shall assume full responsibility for the protection and safekeeping of materials under this contract stored on site, including receiving, unloading and storage.

E. Move materials under CONTRACTOR's control that interfere with operations of the OWNER, Property Owner, or OWNER'S representative.

F. Several of the sites are active fire stations and an active solid waste transfer station and recycling center. The CONTRACTOR shall coordinate all operations and activities, with responsible on-site personnel. Additional safety precautions shall be employed to protect the public as necessitated by the site owners. At no time shall the construction activities interfere with the intended use of the site / property.

1.12 PERMITS AND LICENSES

A. CONTRACTOR shall obtain, at his expense, all permits and licenses necessary for the construction of the Project.

END OF SECTION

SECTION 01 14 33

WORK IN SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION RIGHTS-OF-WAY

PART 1 - GENERAL

1.1 DESCRIPTION

A. General. All work within the rights-of-way of the South Carolina Department of Transportation (SCDOT) shall be done in accordance with the contract documents and the SCDOT's requirements. Upon completion of such work, the Contractor shall present to the Engineer written certificates in duplicate from SCDOT stating that the work has been done in accordance with the SCDOT's requirements and is acceptable to them. All work in the SCDOT's rights-of-way shall be guaranteed for one year after completion of the Contract by the Contractor.

B. Pipe Cover. The top of the pipeline or casing shall be installed at a minimum depth of 4-feet 0-inches below the road cross-section and 2-feet 0-inches below the flow line of side ditches. See plans for any allowable exceptions.

C. Backfilling. All trenches in highway rights-of-way shall be backfilled in layers not exceeding six (6) inches and each layer shall be thoroughly tamped by a mechanical tamp before the next layer is placed. All excess excavated material shall be removed and disposed of outside the limits of the right-of-way in such a manner as not to interfere with drainage of highways unless otherwise directed by a representative of the SCDOT.

D. Pipeline Crossings. All pipe line crossings of paved roads shall be made by means of jacking, boring, drilling or open cutting as shown on the Drawings. Casing and carrier pipe shall be the size and type as shown on the plans. Where open cutting is allowed, the trench width shall be as narrow as possible and in no case exceed the width shown on the plans. Whenever the traveled portion of roadway is cut only one-half of the road width shall be opened at one time. Before the other half is cut, the first opening shall be made usable, safe and maintained for traffic.

E. Pavement Replacement. Where it is necessary to cut existing pavements in roads, the road shall be repaired with a surface of the same type as shown on Drawings. All replaced surfacing shall meet the requirements of the SCDOT both as to material and performance of work. If mutually satisfactory arrangements can be made with the SCDOT's Engineer through whose division the pipeline passes, pavement may be restored by the SCDOT's maintenance forces with the Contractor assuming the cost of replacement.

F. Inspection. Before any crossing of a highway is made, written notice shall be given to the SCDOT's Engineer, forty- eight (48) hours in advance so that an Inspector may be assigned to the work at the SCDOT Engineer's option. Any inspector assigned to the pipe laying operations shall have full authority to act in behalf of the SCDOT and to stop any work affecting highways, provided the work is not being performed in accordance with the SCDOT's requirements. The cost of any such inspection shall be borne by the Contractor.

G. Maintenance. All work done in the SCDOT's right-of-way shall be maintained by the Contractor for a period of one year after completion of the Contract. The SCDOT shall request the Contractor to make any repairs to work not satisfactorily maintained, and if not brought up to the SCDOT's standard, may be repaired by the SCDOT's forces and all cost of repairs shall be charged to the Contractor.

H. Accident Prevention. Prior to the commencement of any construction related activities, the Contractor shall submit an SCDOT approved traffic control plan for work near or in SCDOT Right-of –Way, to the Owner. This plan shall be in accordance with the latest edition of the SCDOT Standard Specifications for Highway Construction, Section 601.1.2 Traffic Control Plan. Barricades, signs, lights, flagmen, watchmen and pilot cars shall be used where required by the SCDOT Engineer or his representative and shall conform to SCDOT Standards as established in the "Manual on Uniform Traffic Control Devices". Each Contractor shall obtain copies of this manual for each work crew and shall insure that all work conforms to the manual. All operations in the SCDOT's rights-of-way shall be conducted at all times in such a manner so as not to create a hazard to or impede the flow of traffic that would be inconsistent with SCDOT's requirements and flow of traffic as directed in the approved traffic plan. A minimum of one way traffic shall be maintained at all time. All costs for these items shall be included in the base bid.

I. Existing Culvert. Wherever a pipe line must be installed beyond the ditch line because of the location of a box culvert, bridge pipe culvert or any other highway structure, a minimum horizontal distance of six (6) feet shall be maintained between the pipeline and any portion of the highway structure and the pipelines shall be installed a minimum depth of one (1) foot below the existing stream bed. When a main is buried in the fill over a culvert, it must be located at least eighteen (18) inches from the inside face of the headwall. Contractor installing pipe lines under existing drain pipes shall maintain a minimum clearance of one (1) foot between the existing pipe culvert and the main.

J. Boring or Jacking. The length, diameter and thickness of the steel pipe encasements shall be as shown on the Drawings or specified herein. The encasement pipe shall be installed by dry boring or jacking. As the dry boring operation progresses, each new section of the encasement pipe shall be butt welded to the section previously jacked into place. The boring auger shall not be of a greater diameter than the outside diameter of encasement and voids are to be filled with grout at 50 psi pressure to insure that there will not be settlement of the roadway.

K. In the event that an obstruction is encountered during the dry boring operation, the auger and steel pipe encasement are to be withdrawn and the void is to be completely filled with grout at 50 psi pressure before moving to another boring site.

L. At all bore locations, the length of casing pipe is shown on the plans. The Contractor will review all bore locations with the Engineer or his representative prior to commencing work to confirm the length of casing pipe required. In no case will pavement be cut unless specifically authorized by SCDOT.

M. No pipe line, including service connections, shall be installed in open trench unless actually shown on Drawings as open cut. All service connections shall be bored, driven or punched under roadways maintained by the SCDOT.

PART 2 - PRODUCTS – (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 SPECIAL PROVISIONS

A. The Special Provisions applicable to each area of the project are included in Appendix A. (Encroachment Permits)

END OF SECTION

SECTION 01 22 00
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers methods of measurement and payment for items of work included in the Bid Form.

1.2 GENERAL

A. The total bid price shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plans, equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as to pay item in the Bid Form shall be considered subsidiary obligations of Contractor and all costs in connection therewith shall be included in the prices bid.

1.3 ESTIMATED QUANTITIES

A. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work, and (b) for the purpose of comparing the bids submitted for the Work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefor.

B. Except where otherwise specified, the unit or lump sum price bid for each item of work which involves excavation or trenching shall include all costs for such work. No direct payment shall be made for excavation or trenching unless shown elsewhere.

1.4 MEASUREMENT AND PAYMENT

A. Site 1 – U.S. Route 176 TMS# 382-17, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, concrete driveway, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 1.

B. Site 2 – 166 Tyger River Road TMS# 546-27, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, concrete driveway, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 2.

C. Site 3 – 1163 Leitzsey Road TMS# 684-26, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, concrete driveway, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 3.

D. Site 4 – 3464 Highway 34 TMS# 615-10, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, concrete driveway, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 4.

E. Site 5 – 10671 Broad River Road (Recycling Center) TMS# 673-18, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, gravel driveways, concrete and asphalt driveways, sediment and erosion control devices, traffic control, work zone protection, etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 5.

F. Site 6 – 6167 Brazelmans Bridge Rd TMS# 486-4, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, asphalt driveways, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 6.

G. Site 7 – 4126 Mt. Pleasant Road TMS# 553-2, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, gravel driveways, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 7.

H. Site 8 – 5725 Dogwalla Rd TMS# 603-5, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, gravel driveways, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 8.

I. Site 9 – 456 Graham Cemetery Rd TMS# 619-36, (Lump Sum):

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, gravel driveways, concrete and asphalt driveways, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 9.

J. *Site 10 – 15804 U.S. Route 176 TMS#442-1, (Lump Sum):*

1. The lump sum price bid for each site shall include all items necessary for completion of the site improvements as shown on the drawings including but not limited to: mobilization, bonds & insurance, clearing and grubbing, construction staking, site preparation, furnishing and installing Fiberglass Reinforced Plastic Water Tank in accordance with the Manufacturer's specifications, concrete deadman, gravel backfill, gravel driveways, concrete and asphalt driveways, sediment and erosion control devices, traffic control etc. The lump sum price bid shall include the cost of furnishing and transporting all materials, stockpiling of materials, testing, workmanship, equipment, bracing and shoring, tools, supplies, and incidentals necessary for completion of the tank installation and site improvements. This item shall be measured and paid for as the Lump Sum for Site 10.

K. *No. 57 Stone (CY)*: No. 57 Stone shall include the costs for furnishing and placing aggregate in accordance with the construction plans. The cost shall include all materials, labor, tools, equipment, and incidentals necessary for the placement of No. 57 Stone. Measurement and Payment shall be made by the square yard (CY) of No. 57 Stone completed and accepted in place.

L. Geotextile Underlayment – (Class 2) Type C (SY): Geotextile Underlayment – (Class 2) Type C shall include all costs associated with the placement of geotextile underlayment in accordance with the project specifications and construction plans. The cost shall include all materials, labor, tools, equipment, and incidentals necessary for the placement of geotextile. Measurement and Payment shall be made by the square yard (SY) of Geotextile Underlayment completed and accepted in place.

M. Asphalt Paving (SY): Asphalt paving shall include the costs of all asphalt and subgrade material necessary for the construction of asphalt driveways in accordance with the drawings. The cost shall include all materials, labor, tools, equipment, and incidentals necessary to construct asphalt driveways. Measurement and Payment shall be made by the square yard (SY) of Asphalt Driveway completed and accepted in place.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)

END OF SECTION

SECTION 01 25 13
PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. The procedure for requesting substitution approval for a product which is specified by descriptive or performance criteria or defined by reference to one or more of the following:
      a. Name of manufacturer.
      b. Name of vendor.
      c. Trade name.
      d. Catalog number.
   2. This Section does not address substitutions for major equipment. See "Instructions to Bidders."

B. Related Sections include but are not necessarily limited to:
   1. Bidding Requirements, Contract Forms, and General Conditions.
   2. Division 1 - General Requirements.

C. Requests for Substitution - General:
   1. Base all bids on materials, equipment, and procedures specified.
   2. Certain types of equipment and kinds of material are described in specifications by means of references to names of manufacturers and vendors, trade names, or catalog numbers. When this method of specifying is used, it is not intended to exclude from consideration other products bearing other manufacturer's or vendor's names, trade names, or catalog numbers, provided said products are capable of accomplishing the same tasks as the products specifically indicated.
   3. Other types of equipment and kinds of material may be acceptable.

1.2 QUALITY ASSURANCE

A. In making request for substitution or in using an approved product, Contractor represents:
   1. He has investigated proposed product, and has determined that it is adequate or superior in all respects to that specified, and that it will perform function for which it is intended.
   2. He will provide same guarantee for substitute item as for product specified.
   3. He will coordinate installation of accepted substitution into work, to include building modifications if necessary, making such changes as may be required for work to be complete in all respects.
   4. He waives all claims for additional costs related to substitution which subsequently arise.

1.3 DEFINITIONS

A. Product: Manufactured material or equipment.

1.4 PROCEDURE FOR REQUESTING SUBSTITUTION

A. Considered after award of Contract.

B. Written requests through Contractor only.

C. Transmittal Mechanics:
   1. Follow the transmittal mechanics prescribed for shop drawings in Section 01 33 00.
      a. Product substitution will be treated in a manner similar to "deviations," as described in Section 01 33 00, Paragraph 1.3 B.6.

b. List the letter describing the deviation and justifications on the transmittal form in the space provided under the column with the heading "DESCRIPTION."
   1) Include in the transmittal letter, either directly or as a clearly marked attachment, the items listed in paragraph D below.

D. Transmittal Contents:
   1. Product identification:
      a. Manufacturer's name.
      b. Telephone number and representative contact name.
      c. Specification section or drawing reference of originally specified product, including discrete name or tag number assigned to original product in the Contract Documents.
   2. Manufacturer's literature clearly marked to show compliance of proposed product with Contract Documents.
   3. Itemized comparison of original and proposed product addressing product characteristics including but not necessarily limited to:
      a. Size.
      b. Composition or materials of construction.
      c. Weight.
      d. Electrical or mechanical requirements.
   4. Product experience:
      a. Location of past projects utilizing product.
      b. Name and telephone number of persons associated with referenced projects knowledgeable concerning proposed product.
      c. Available field data and reports associated with proposed product.
   5. Data relating to changes in construction schedule.
   6. Data relating to changes in cost.
   7. Samples:
      a. At request of Engineer.
      b. Full size if requested by Engineer.
      c. Held until substantial completion.
      d. Engineer not responsible for loss or damage to samples.

1.5 APPROVAL OR REJECTION

A. Written approval or rejection of substitution given by the Engineer.

B. Engineer reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.

C. In event substitution results in a change of Contract price or time, provisions in General Conditions will be applied for adjustment.

D. Substitutions will be rejected if:
   1. Submittal is not through the Contractor with his stamp of approval.
   2. Requests are not made in accordance with this Section.
   3. In the Engineer's opinion, acceptance will require substantial revision of the original design.
   4. In the Engineer's opinion, substitution is not equal to original product specified or will not perform adequately the function for which it was intended.

END OF SECTION

SECTION 01 30 00
SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference shall be held at the County of Newberry after award of Contract. Engineer will notify the Contractor as to the date, time and location of the conference. Contractor's Project Manager and Project Superintendent and Contractor's Subcontractor Representatives shall attend.

1.2 DRAWINGS AND CONTRACT DOCUMENTS FOR CONTRACTOR USE

A. Refer to General Conditions

B. Contractor shall pick up all documents within 10 days from date of Notice to Proceed.

1.3 ORDER OF CONSTRUCTION AND CONSTRUCTION SCHEDULE

A. See General Conditions Paragraph 4.10.

1.4 PROJECT MEETINGS

A. The Engineer will conduct construction meetings as needed involving:
   1. Contractor's project manager.
   2. Contractor's project superintendent.
   3. Owner's designated representative(s).
   4. Engineer's designated representative(s).
   5. Contractor's subcontractors as appropriate to the work in progress.

B. Meetings conducted may be called by ENGINEER at convenient times throughout duration of the Project.

C. The Engineer will take meeting minutes and submit copies of meeting minutes to participants and designated recipients identified at the Preconstruction Conference. Corrections, additions or deletions to the minutes shall be noted and addressed at the following meeting.

D. The Engineer will schedule meetings for most convenient time frame.

E. The Engineer will have available at each meeting full chronological file of all previous meeting minutes.

F. The Contractor shall have available at each meeting up-to-date record drawings.

1.5 SPECIAL CONSIDERATIONS

A. Contractor shall be responsible for negotiations of any waivers or alternate arrangements required to enable transportation of materials to the site.

B. Store and stockpile materials in an orderly manner on the SCDOT right-of-way and keep the encroachment on the roadway to a minimum. Ensure that the road is totally clear by the end of day's work.

C. Maintain in good repair temporary structures, fences, barricades, and other related items.

D. Electrical Power and Lighting. The electrical power required during construction shall be provided by each Contractor as required by him. This service shall be installed by a qualified electrical contractor. Lighting shall be provided by each Contractor in all spaces at all times where necessary for good and proper workmanship, for inspection or for safety.

E. Special Hazards. Each Contractor and his subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against the following special hazards:
   1. Blasting
   2. Excavation
   3. Flooding

F. Safety. Each Contractor alone shall be solely and completely responsible for conditions of the job site in connection with his work, including safety of all persons and property, preparatory to and during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.
   1. The Construction Documents, and the construction hereby contemplated are to be governed, at all times, by applicable provisions of local and State laws and regulations, and Federal laws, including but not limited to, the latest amendments of the following: Department of Labor, Bureau of Labor Standards Safety and Health Regulations for Construction, and Williams and Steiger Occupational Safety and Health Act of 1970, including rules and regulations pursuant thereto, applicable to the Work and performance of the Contract (OSHA).
   2. The duty of the Engineer to conduct construction review of each Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on, or near the construction site.
   3. All explosives shall be stored in a secure manner and all storage places shall be marked clearly "DANGEROUS EXPLOSIVES", and shall be in the care of competent watchmen at all times.

G. Inspections by Federal and State Agencies. Authorized representatives and agents of the State and Federal Government shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records.

H. Water. Water used on the project shall be fresh and of drinkable quality. Water obtained from nearby streams will not be acceptable for use on the project.

1.6 DATA AND MEASUREMENTS

A. The data given in the specifications and shown on the Plans and Drawings is believed to be accurate but the accuracy is not guaranteed. The Contractor must take all levels, locations, measurements, and verify all dimensions of the job site prior to construction and must adapt his work into the exact construction. Scale measurements taken from prints are not considered for more than reference, larger scale drawings take precedence over smaller scale, and shop drawings take precedence over all others.

1.7 PROTECTION AND RESTORATION OF PUBLIC AND PRIVATE PROPERTY, INCLUDING EASEMENTS

A. General. Carefully protect all public and private property affected by construction operations. Such restorations shall include clearing of rock and debris, seeding, sodding, and transplanting of lawns, hedges, or ornamental plantings and repair or replacement of driveways, driveway culverts, walks, or other private facilities.
   1. Trees that are to be protected will be shown on the Plans or will be marked by the Owner prior to construction. Prior to any clearing, the Contractor shall schedule meeting with a representative of the Owner, and the Engineer to discuss the work and agree on marking trees that can be protected.
   2. Confirm the marking of trees with the Inspector at least seventy-two (72) hours prior to the start of any construction, to ensure that all trees to be protected have been marked.

3. Take every precaution to protect trees from damage by boarding or wrapping of trunks, tying back limbs, etc. On all standing trees, marked or otherwise, any broken limbs shall be neatly removed, any scarred or barked areas shall be neatly repaired, any cut roots shall be trimmed and all painted with a tree paint approved by the Engineer.

B. Repair of Lawn or "Kept" Areas. Any area stripped of vegetation shall not be left for more than fourteen (14) days without top soiling and seeding. This includes stockpiled dirt, regardless of its location.
   1. All areas disturbed by construction shall be regraded to original contours leaving the ground free from lumps, ridges and depressions which would cause standing water.
   2. All lawn or "kept" areas shall be reseeded as per Section 32 92 00.
   3. Properly care for all areas, and supply sufficient water to insure proper growth of grass. Replant all areas where grass is not established at intervals of ten (10) days, continuing until a good growth of grass is established.
   4. Topsoil as defined in this section shall be original topsoil removed and stockpiled for this purpose.
   5. Excess excavated soil as a result of the tank installation shall be removed and disposed of by the contractor at their expense and included in the lump sump price of the tanks installations.

C. Restoration of Driveways, Driveway Culverts, and Pavements. When open cutting of driveways is approved, saw all asphaltic and concrete drives and pavements prior to excavation. Protect wet area from cracks or other change. Replace all drives, driveway culverts, and pavements with materials similar in color, surface, texture and alignment of the existing pavements and in accordance with the pavement replacement detail on the Plans. Coordinate any driveway closing with the property Owner.

1.8 SITE CONDITIONS

A. The Contractor acknowledges that he has investigated prior to bidding and satisfied himself as to the conditions affect in the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, water tables, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of each site, including all exploratory work done on behalf of the Owner on the site or any contiguous site, as well as from information presented by the drawings and specifications made a part of this Contract, or any other information made available to him prior to receipt of Bids. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the Owner.

1.9 CLEANUP REQUIREMENTS

A. Cleanup operations shall be conducted daily.
   1. Contractor shall keep the work areas free at all times from accumulations of waste materials and rubbish.
   2. Volatile waste shall be properly stored in covered metal containers and removed daily.
   3. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and anti-pollution laws.

B. Contractor shall make the necessary arrangements for proper off-site storage areas.

C. Contractor shall keep all equipment and materials within construction easements of road rights-of-way and protect private property from damage due to construction.

1.10 HISTORICAL AND ARCHAEOLOGICAL

A. If during the course of construction, evidence of deposits of historical or archaeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Owner. No further disturbance of the deposits shall ensue until the Contractor has been notified by the Owner that Contractor may proceed. Compensation to the Contractor, if any, for lost time or changes in construction resulting from the find, shall be determined in accordance with changed or extra work provisions of the Contract Documents."

1.11 EROSION CONTROL SPECIAL CONDITIONS

A. Contractor's attention is directed to the approved "Notification Form for Sites Disturbing Less than 1-acre (Not Part of a Larger Common Plan, Non-Coastal County)" which is attached in Appendix B. All requirements shall be in force and maintained by Contractor as required during the performance of the project.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)

END OF SECTION

SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. General:
   1. Section Addresses:
      a. Mechanics and administration of the submittal process for shop drawings, operation and maintenance manuals, and miscellaneous submittal items.

B. Related Sections include but are not necessarily limited to:
   1. Sections in Divisions 3, 31, and 33, submittal requirements.

1.2 SUBMITTALS: GENERAL

A. Transmit all submittals to:
   HDR|ICA Engineering, Inc.
   1122 Lady Street
   Columbia, SC 29201
   Attn: Thomas Miller, PE

B. Ensure all transmittals are from Contractor and bear his approval stamp. Transmittals will not be received from or returned to subcontractors.

C. Provide submittal information defining specific equipment or materials utilized on the project. Generalized product information not clearly defining specific equipment or materials to be provided will be rejected.

D. Calculations required in individual specification sections will be received for information purposes only and will be returned stamped "E. Engineer's Review Not Required" to acknowledge receipt.

E. Assure submittals meet the following schedule:
   1. Shop drawings:
      a. Submittal and approval prior to 50 percent completion.
   2. Schedule of shop drawings.
      a. Submitted and approved within 90 days of receipt of Notice to Proceed.
   3. Operation and Maintenance Manuals and Data Record Sheets:
      a. Initial submittal within 60 days after date shop drawings are approved.
      b. Payment will not be made on any equipment or materials until an approved Operation and Maintenance Manual is received.

F. Retainage will not be reduced below five (5) percent until all shop drawings are approved.

G. Final payment on the project shall not be made until final approved copies of all Operation and Maintenance Manuals including Equipment Record Sheets (with equipment serial numbers) have been received.

1.3 SUBMITTALS: SHOP DRAWINGS

A. Transmittal Mechanics:
   1. Utilize two separate transmittals to transmit all shop drawings for equipment/products to be incorporated into the work. Provide a separate transmittal for any samples associated with aforementioned shop drawing.
   2. Number transmittals consecutively beginning with 1.

3. Assure resubmitted items retain the original number but with an added suffix letter starting with "A."
4. Assure only one specification section is covered by one letter of transmittal.
5. Provide breakout of each transmittal component on transmittal form "A." Each component thus defined shall receive specific action by the Engineer. Define manufacturer, item, tag number, and Drawing/Specification reference.
6. Do not change the scope of any resubmittal from the original transmittal scope. If some components of the original transmittal are approved and others are not, the Contractor shall not resubmit the approved components in subsequent resubmittal packages. Provide a summary sheet containing all components of the original transmittal at the front of each resubmittal. Indicate each component as either "approved," "outstanding," or "submitted for action." Items previously approved shall be referenced to the transmittal in which approval was received. "Outstanding" items are defined as items unapproved and not yet resubmitted for action. "Submitted for action" shall indicate items which are included for review in the transmittal.
7. Provide four (4) copies of each submittal for the Engineer plus the number required by the Contractor. The total number of copies shall not exceed ten (10).
8. For items not covered in paragraph 7, submit one reproducible transparency and one print of each drawing until approval is obtained. Utilize mailing tube, do not fold. The reproducible shall be marked and returned to the Contractor for his reproduction and distribution.
9. Provide clear space (3 IN SQ) for Engineer stamping of each component defined in A.1.
10. Marks on transmittal by Contractor shall not be in red and shall be duplicated on all copies transmitted. Outline Contractor marks on reproducible transparencies with a rectangular box.

B. Transmittal Contents:
1. Coordinate and identify shop drawing contents so that all items can be easily verified by the Engineer.
2. Identify equipment or material use, tag number, drawing detail reference, weight, and other project specific information.
3. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
4. Water Tank submittals should also be stamped by the manufacture indicating their review of details and that the inclusion of the tank accessories meeting their requirements of the manufactures installation manual.
5. Submit items like equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8-1/2 x 11 inch pages. Indicate exact item or model and all proposed options.
6. Include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout drawings, parts catalogs, rough-in diagrams, wiring diagrams, controls, weights and other pertinent data. Arrange data and performance information in format similar to that provided in Contract Documents. Provide, at minimum, the detail provided in the Contract Documents.
7. If proposed equipment or materials deviate from the Specifications or Drawings in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following the transmittal sheet. If explanation is not given, shop drawings will be returned without action.

1.4 SUBMITTALS: SAMPLES

A. Identify sample as to: manufacturer, item, use, type, project designation, tag number, specification section or drawing detail reference, color, range, texture, finish and other pertinent data.

B. Include application specific brochures, and installation instructions.

C. Provide Contractor's stamp of approval on samples as indication of his checking and verification of dimensions and coordination with interrelated work.

D. Resubmit samples of rejected items.

E. Approved samples submitted or constructed, constitute criteria for judging completed work. Finished work or items not equal to samples will be rejected.

F. Samples may be retained for comparison purposes and the Contractor shall remove samples when directed. Contractor to include in bid all costs of furnishing and removing samples.

1.5 SUBMITTALS: OPERATION, MANUFACTURER INSTALLATION MANUAL AND MAINTENANCE MANUALS AND EQUIPMENT RECORD SHEETS

A. Transmittal Mechanics:
1. See Paragraph 1.2 C.
2. Provide transmittal form for Operation and Maintenance Manual with original number of the approved item plus a suffix "O-M."
3. Submit one copy until approval is received.
4. Acceptable submittals will be retained with the transmittal form returned with a request for five additional copies.
5. Deficient submittals will be returned along with the transmittal form which will be marked to indicate deficient areas.
6. Identify resubmittals with the original number plus a suffix letter starting with "A."
7. Submit Operation and Maintenance Manuals printed on 8-1/2 x 11 IN size heavy first quality paper with standard three-hole punching and bound in stiff metal hinged binder constructed as a three-post style. Provide binders with titles. Tab each section of manuals for easy reference with plastic-coated dividers. Provide index for each manual.
8. Reduce drawings or diagrams bound in manuals to an 8-1/2 x 11 IN or 11 x 17 IN size. However, where reduction is not practical to ensure readability, fold larger drawings separately and place in vinyl envelopes which are bound into the binder. Identify vinyl envelopes with drawing numbers.

B. Transmittal Content:
1. Submission of Operation and Maintenance Manuals is applicable but not necessarily limited to:
   a. Major equipment.
   b. Tank Accessories.
   c. Manufacturers Installation Manual
2. Prepare operation and maintenance manuals which include, but are not necessarily limited to, the following detailed information, as applicable:
   a. Equipment function, normal operating characteristics, limiting operations.
   b. Assembly, disassembly, installation, alignment, adjustment, and checking instructions.
   c. Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
   d. Lubrication and maintenance instructions.
   e. Guide to "troubleshooting."
   f. Parts list and predicted life of parts subject to wear.
   g. Outline, cross-section, and assembly drawings; engineering data; and electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, word description of wiring diagrams and interconnection diagrams.
   h. Test data and performance curves.
   i. A list of recommended spare parts with a price list and a list of spare parts provided under these specifications.
   j. Copies of installation instructions, parts lists or other documents packed with equipment when delivered.
   k. Instrumentation or tag numbers relating the equipment back to the Contract Documents.

l. Include a filled-out copy of the Equipment Record Sheet as the first page(s) of each Operation and Maintenance Manual. Complete maintenance requirements in detail. Simple reference to the Manual is not acceptable.
m. For equipment items involving components or subunits, an Equipment Record Sheet for each operating component or subunit is required.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 SUBMITTALS: APPROVAL OR REJECTION

A. Items within Transmittals will be reviewed for overall design intent and will receive one of the following Actions:
   A - FURNISH AS SUBMITTED
   B - FURNISH AS NOTED (BY ENGINEER)
   C - REVISE AND RESUBMIT
   D - REJECTED

B. Transmittals returned with approval "A" or "B" are considered ready for fabrication and installation. If for any reason a transmittal that has an "A" or "B" approval is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal. The Contractor shall assure that previously approved documents are destroyed when they are superseded by a resubmittal as such.

C. Transmittals with Approval "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected) will be individually analyzed giving consideration as follows:
   1. The portion of the transmittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference). The "C" or "D" drawings will be marked up and returned to the Contractor. It shall be the Contractor's responsibility to ensure that these items are corrected and resubmitted.
   2. Items marked "A" or "B" will be fully distributed.
   3. If a portion of the items or system proposed are acceptable, however, the major part of the individual drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" action. This is at the sole discretion of the Architect/Engineer. In this case, some drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package." Distribution to the Owner and field will not be made (unless previously agreed to otherwise).

D. Failure to include any specific information specified under the submittal paragraphs of the specifications shall result in the transmittal being returned to the Contractor unapproved.

E. All costs, associated with the review of any shop drawing resubmitted more than once shall be borne by the Contractor with said costs being deducted from the lump sum amount shown in the Contractor's proposal.

F. In addition to calculations stamped and returned "E. Engineer's Review Not Required," other transmittals such as submittals which the Engineer considers as "Not Required," submittal information which is supplemental to but not essential to prior submitted information, or items of information in a transmittal which have been reviewed and approved in a prior transmittal, will be returned with action "E. Engineer's Review Not Required."

END OF SECTION

SECTION 01 35 05
ENVIRONMENTAL PROTECTION AND SPECIAL CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Addresses:
   1. Minimizing the pollution of air, water, or land; control of noise, the disposal of solid waste materials, and protection of deposits of historical or archaeological interest.

1.2 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00.
   2. Prior to the start of any construction activities submit:
      a. A detailed proposal of all methods of control and preventive measures to be utilized for environmental protection.
      b. A drawing of the work area, haul routes, storage areas, access routes and current land conditions including trees and vegetation.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Employ and utilize environmental protection methods, obtain all necessary permits, and fully observe all local, state, and federal regulations.

B. Land Protection:
   1. Except for any work or storage area and access routes specifically assigned for the use of the Contractor, the land areas outside the limits of construction shall be preserved in their present condition. Contractor shall confine his construction activities to areas defined for work within the Contract Documents.
   2. Manage and control all borrow areas, work or storage areas, access routes and embankments to prevent sediment from entering nearby water or land adjacent to the work site.
   3. Restore all disturbed areas including borrow and haul areas and establish permanent type of locally adaptable vegetative cover.
   4. Unless earthwork is immediately paved or surfaced, protect all side slopes and back slopes immediately upon completion of final grading.
   5. Plan and execute earthwork in a manner to minimize duration of exposure of unprotected soils.
   6. Except for areas designated by the Contract Documents to be cleared and grubbed, the Contractor shall not deface, injure or destroy trees and vegetation, nor remove, cut, or disturb them without approval of the Engineer. Any damage caused by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense.

C. Surface Water Protection:

1. Unless otherwise approved by Engineer, restrict construction operations in streams and impoundments to those areas that must be entered for the construction of temporary or permanent structures. As soon as conditions permit, promptly clear streams and impoundments of all falsework, pilings to be removed, debris, and other obstructions placed therein or caused by the construction operations. Avoid frequent fording of live streams with construction equipment; use temporary bridges or other structures wherever an appreciable number of stream crossings are necessary. Unless otherwise approved by Engineer, do not operate mechanized equipment in live streams except as may be required to construction channel changes and temporary or permanent structures, and to remove temporary structures.
    a. If Contractor fails to adequately control erosion, pollution, and/or situation, Owner reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct costs will be charged to the Contractor.
2. Utilize, as necessary, erosion control methods to protect side and back slopes, and minimize the discharge of sediment to the surface water leaving the construction site as soon as rough grading is complete. These controls shall be maintained until the site is ready for final grading and landscaping or until they are no longer warranted and concurrence is received from the Engineer. Physically retard the rate and volume of runon and runoff by:
    a. Implementing structural practices such as diversion swales, terraces, straw bales, silt fences, berms, storm drain inlet protection, rocked outlet protection, sediment traps and temporary basins.
    b. Implementing vegetative practices such as temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffers, hydroseeding, anchored erosion control blankets, sodding, vegetated swales or a combination of these methods.
    c. Providing Construction sites with graveled or rocked access entrance and exit drives and parking areas to reduce the tracking of sediment onto public or private roads.
3. Discharges from the construction site shall not contain pollutants at concentrations that produce objectionable films, colors, turbidity, deposits or noxious odors in the receiving stream or waterway.

D. Solid Waste Disposal:
1. Collect solid waste on a daily basis.
2. Provide disposal of degradable solid waste to an approved solid waste disposal site.
3. Provide disposal of nondegradable solid waste to an approved solid waste disposal site or in an alternate manner approved by Engineer and regulatory agencies.
4. No building materials wastes or unused building materials shall be buried, dumped, or disposed of on the site.

E. Fuel and Chemical Handling:
1. Store and dispose of chemical wastes in a manner approved by regulatory agencies.
2. Take special measures to prevent chemicals, fuels, oils, greases, herbicides, and insecticides from entering drainage ways.
3. Do not allow water used in onsite material processing, concrete curing, cleanup, and other waste waters to enter a drainage way(s) or stream.
4. The Contractor shall provide containment around fueling and chemical storage areas to ensure that spills in these areas do not reach waters of the state.

F. Control of Dust:
1. The control of dust shall mean that no construction activity shall take place without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne so that it remains visible beyond the limits of construction. Reasonable measures may include paving, frequent road cleaning, planting vegetative groundcover, application of water or application of chemical dust suppressants. The use of chemical agents must be approved by the State of South Carolina DOT.
2. Utilize methods and practices of construction to eliminate dust in full observance of agency regulations.

3. The Engineer will determine the effectiveness of the dust control program and may request the Contractor to provide additional measures, at no additional cost to Owner.

G. Burning:
   1. Do not burn material on the site. If the Contractor elects to dispose of waste materials by burning, make arrangements for an off-site burning area and conform to all agency regulations.

H. Control of Noise:
   1. Control noise by fitting equipment with appropriate mufflers.

I. Completion of Work:
   1. Upon completion of work, leave area in a clean, natural looking condition.
   2. Ensure all signs of temporary construction and activities incidental to construction of required permanent work are removed.

J. Historical Protection:
   1. If during the course of construction, evidence of deposits of historical or archaeological interests are found, cease work affecting find and notify Engineer. Do not disturb deposits until written notice from Engineer is given to proceed.
   2. The Contractor will be compensated for lost time or changes in construction to avoid the find based upon normal change order procedures.

K. Petroleum Contaminated Soils:
   1. If petroleum contaminated soils are encountered, notify Owner and Engineer immediately.
   2. Where these soils are found, excavate the entire trench and replace with Select Fill upon backfilling.
   3. Petroleum contaminated soils are not to be stockpiled. The soils must be hauled to a State approved facility permitted to accept this material.
   4. Ferrous piping materials with nitrile gaskets shall be installed where petroleum contaminated soils were present in the trench.

END OF SECTION

SECTION 01 65 50
PRODUCT DELIVERY, STORAGE, AND HANDLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Scheduling of product delivery.
   2. Packaging of products for delivery.
   3. Protection of products against damage from:
      a. Handling.
      b. Exposure to elements or harsh environments.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and General Conditions.
   2. Division 01 - General Requirements.

C. Payment:
   1. No payment will be made to Contractor for equipment or materials not properly stored and insured or without approved shop drawings.
      a. Previous payments for items will be deducted from subsequent progress estimate(s) if proper storage procedures are not observed.

1.2 DELIVERY

A. Scheduling:
   1. Schedule delivery of products or equipment as required to allow timely installation and to avoid prolonged storage.

B. Packaging:
   1. Deliver products or equipment in manufacturer's original unbroken cartons or other containers designed and constructed to protect the contents from physical or environmental damage.

C. Identification:
   1. Clearly and fully mark and identify as to manufacturer, item, and installation location.

D. Protection and Handling:
   1. Provide manufacturer's instructions for storage and handling.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 PROTECTION, STORAGE AND HANDLING

A. Unloading:
   1. Equipment and facilities for unloading, hauling, distributing and storing materials shall be furnished by the Contractor and shall at all times be available for use in unloading materials.

B. Handling:

1. Proper and suitable tools and equipment shall be used for the safe and convenient handling and installation of the FRP tanks and equipment. Pipe, fittings and other materials shall be carefully handled so as to prevent breakage and as to prevent damage to the fittings. FRP tanks shall not be unloaded by rolling or dropping off of trucks or cars, but shall be handled by carefully lifting and lowering into position, using approved slings or clamps which shall be provided for the purpose. If any tank, pipe or fitting is discovered to be cracked, broken or defective, after being laid, it shall be removed and replaced with sound material at the expense of the Contractor. All pipe and fittings shall be thoroughly cleaned before being installed and shall be kept clean until accepted in the completed work.

C. Distribution:
   1. Materials shall be distributed and placed so as to least interfere with traffic. No street or roadway may be closed without first obtaining permission of the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which material is distributed. No distributed materials shall be placed in drainage ditches.

D. Storage:
   1. All FRP Tanks, fittings and other materials that cannot be stored on the site of the work, shall be stored by the contractor for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas.
   2. Excavation spoils and fill stock piles shall not be stored on any site in any way that inhibits the Property Owners use of the residence. All stockpiles/ spoils piles shall have silt fence installed around the perimeters as shown on the construction plans. The Contractor shall furnish, install, maintain, inspect and if necessary replace all erosion and sediment control measures.

3.2 FIELD QUALITY CONTROL

A. Inspect Deliveries:
   1. Inspect all products or equipment delivered to the site prior to unloading. Reject all products or equipment that are damaged, used, or in any other way unsatisfactory for use on Project.

B. Monitor Storage Area:
   1. Monitor storage area to ensure security of materials and equipment to be incorporated into the project. Provide protection from adverse weather conditions and ensure suitable temperature and moisture conditions are maintained.

END OF SECTION

SECTION 01 70 00
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Description of procedures to be followed and related work required to accomplish an orderly transfer of Project deliverables from the Contractor to the Owner.

B. Related Sections include but are not necessarily limited to:
   1. Division 01 - General Requirements.

1.2 DEFINITIONS

A. Punch List: A list of construction items found to be deficient or incomplete through review of the Work by Engineer and communicated in writing to Contractor at any time during the Contract Period.

B. Record Drawings: Drawings showing changes made during actual construction.

C. Manufacturer Certifications: The contractor will provide a certification from the Tank Manufacture that the installation is in accordance with the manufacturer's recommendations and installation manual.

1.3 SUBMITTALS

A. Substantial Completion:
   1. Contractor shall notify the Owners Engineer that the Contractor considers the Work at a particular site to be in Substantial Completion and request a Substantial Completion inspection.
   2. Record Drawings.
   3. Certificates of Inspection and Occupancy if required in local jurisdiction.
   4. A list of work not yet completed not to be considered for Substantial Completion.
   5. Inventory of extra materials and spare parts ready for delivery to the Owner.
      a. Organize by Specification Sections.
   6. O&M Manuals.

B. Final Completion:
   1. Contractor to notify Engineer that the Contractor considers the entire Work to have progressed to final completion and provide the following documents:
      a. Submittals required for Substantial Completion, and;
      b. Record Drawings;
      c. "Contractor's Affidavit, Release, and Waiver of Claim."
      d. Consent of Surety to Final Payment with Power of Attorney attached.
      e. Sales Tax Certification.
      f. Evidence of payments, if requested by Owner.
      g. Final Payment Request.
      h. Letter from SCDOT accepting the work in their right-of-way.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 DELIVERY OF EXTRA MATERIALS AND SPARE PARTS

A. Provide security and protection from the elements and maintenance, such as rotation of bearing supported shafts, for the entire Contract Period.

B. No deliveries of partial inventories accepted.

C. Upon Substantial Completion, Engineer will notify Contractor in writing that extra materials and spare parts may be delivered.
   1. Deliver to Owner through Engineer unless otherwise directed in writing.
   2. Contractor and representatives of Owner and Engineer shall inspect and inventory all items delivered.
   3. Inventory shall be revised to indicate any items delivered that were damaged or defective.
   4. Contractor and Owner's and Engineer's representatives shall sign inventory certifying that all items listed were delivered and that, unless otherwise noted on the inventory, all items were in good condition at the time of delivery to Owner.

D. Engineer will review inventory for completeness and inform Contractor promptly of any deficiencies therein.

E. Contractor shall replace all damaged and defective items noted on the inventory before requesting final inspection.

3.2 INSPECTION FOR FINAL ACCEPTANCE AND PAYMENT

A. When the items of Work on the Punch List(s) have been completed, and Contractor considers the Work of the entire Project is complete, he shall submit written certification that:
   1. Contract Documents have been reviewed.
   2. Work has been inspected for compliance with Contract Documents.
   3. Work has been completed in accordance with Contract Documents.
   4. Equipment and systems have been tested in the presence of Owner's representative and are operational.
   5. Work is completed and ready for final inspection.
   6. Tank Installation is in accordance with the manufactures installation manual.

B. Engineer and Owner will make an inspection with the Contractor to verify the status of completion within 7 calendar days after receipt of such certification.

C. Should Engineer consider that the Work is incomplete or defective:
   1. Engineer: Notify the Contractor in writing within 7 calendar days, listing the incomplete or defective work.
   2. Contractor: Remedy the stated deficiencies, and send a second written certification to Engineer that the Work is complete.
   3. Engineer will re-inspect the Work.

D. When Engineer finds the Work acceptable in accordance with the Contract Documents: Engineer requests Contractor to make closeout submittals.

E. Re-inspection costs incurred by the Engineer will be billed to the Owner and deducted by the Owner from the final payment to the Contractor.

3.3 FINAL APPLICATION FOR PAYMENT

A. Complete demobilization prior to submitting final application for payment.

B. Submit final application for payment in accordance with procedures and requirements stated in the Conditions of the Contract.

C. Engineer will review application and recommend final payment within 7 calendar days of receipt of application.

END OF SECTION

SECTION 03 09 00
CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete and grout.
   2. Fiber reinforced concrete driveways and slabs.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and General Conditions.
   2. Division 01 - General Requirements.
   3. Division 33 – Storage Tanks; Cast in place- Concrete Slabs, Concrete Deadman anchors.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Concrete Institute (ACI):
      a. 116R, Cement and Concrete Terminology.
      b. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      c. 212.3R, Chemical Admixtures for Concrete.
      d. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
      e. 304.2R, Placing Concrete by Pumping Methods.
      f. 305R, Hot Weather Concreting.
      g. 306R, Cold Weather Concreting.
      h. 318, Building Code Requirements for Structural Concrete.
      i. 347R, Recommended Practice for Concrete Formwork.
   2. ASTM International (ASTM):
      a. A82, Standard Specification Steel Wire, Plain, for Concrete Reinforcement.
      b. A615, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (Including Supplementary Requirements S1).
      c. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
      d. C33, Standard Specification for Concrete Aggregates.
      e. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      f. C94, Standard Specification for Ready-Mixed Concrete.
      g. C138, Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
      h. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
      i. C150, Standard Specification for Portland Cement.
      j. C171, Standard Specification for Sheet Materials for Curing Concrete.
      k. C172, Standard Practice for Sampling Freshly Mixed Concrete.
      l. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
      m. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
      n. C260, Standard Specification for Air Entraining Admixtures for Concrete.
      o. C289, Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
      p. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

q. C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
r. C494, Standard Specification for Chemical Admixtures for Concrete.
s. C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
t. C567, Standard Test Method for Unit Weight of Structural Lightweight Concrete.
u. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
v. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
w. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
x. D1056, Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
y. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
z. E329, Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

3. United States Army Corps of Engineers (COE):
   a. CRD-C572, Polyvinyl Waterstops.
4. International Building Code 2003, with SC amendments

B. Quality Control:
1. Concrete materials testing firm:
   a. Contractor to employ and pay for services of a testing laboratory to:
      1) Perform materials evaluation.
      2) Design concrete mixes.
      3) Perform testing of concrete placed during construction
   b. Concrete testing agency to meet requirements of ASTM E329.
   c. Engineer and/or Owner shall approve Contractor's selection of concrete materials testing firm prior to Notice to Proceed.
2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
   a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
   a. Do not use revised concrete mixes until submitted to and approved by Engineer.
4. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming system has sufficient strength to safely support its own weight plus the loads placed thereon.

C. Qualifications:
1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).

1.3 DEFINITIONS

A. Per ACI 116R except as modified herein:
1. Concrete fill: Non-structural concrete.
2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
3. Exposed concrete: Exposed to view after construction is complete.
4. Indicated: Indicated by Contract Documents.
5. Lean concrete: Concrete with low cement content.
6. Nonexposed concrete: Not exposed to view after construction is complete.
7. Required: Required by Contract Documents.
8. Specified strength: Specified compressive strength at 28 days.

9. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00.
   2. Concrete mix designs proposed for use. Concrete mix design submittal to include the following information:
      a. Sieve analysis and source of fine and coarse aggregates.
      b. Test for aggregate organic impurities.
      c. Test for deleterious aggregate per ASTM C289.
      d. Proportioning of all materials.
      e. Type of cement with mill certificate for cement.
      f. Type of fly ash with certificate of conformance to specification requirements.
      g. Slump.
      h. Air content.
      i. Brand, type, ASTM designation, and quantity of each admixture proposed for use.
      j. 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
      k. Standard deviation value for concrete production facility.
   3. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
      c. Manufacturers and types:
         1) Joint fillers.
         2) Curing agents.
         3) Bonding and patching mortar.
         4) Construction joint bonding adhesive.
         5) Non-shrink grout with cure/seal compound.
         6) Waterstops.
   4. Reinforcing steel: Show grade, sizes, number, configuration, spacing, location and all fabrication and placement details.
      a. In sufficient detail to permit installation of reinforcing without having to make reference to Contract Drawings.
      b. Obtain approval of shop drawings by Engineer before fabrication.
   5. Strength test results of in place concrete including slump, air content and concrete temperature.
   6. Records of any approved job site water addition and corresponding strength test(s).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage of Material:
   1. Cement and fly ash:
      a. Store in moisture proof, weathertight enclosures.
      b. Do not use if caked or lumpy.
   2. Aggregate:
      a. Store to prevent segregation and contamination with other sizes or foreign materials.
      b. Obtain samples for testing from aggregates at point of batching.
      c. Do not use frozen or partially frozen aggregates.
      d. Do not use the bottom 6 inches of stockpiles in contact with ground.
      e. Allow sand to drain until moisture content is uniform prior to use.
   3. Admixtures:
      a. Protect from contamination, evaporation, freezing, or damage.
      b. Maintain within temperature range recommended by manufacturer.
      c. Completely mix solutions and suspensions prior to use.
   4. Reinforcing steel:
      a. Support and store all rebars above ground.

B. Delivery:
   1. Concrete:
      a. Transport from central plant to job site per ASTM C94.
      b. Prepare a delivery ticket for each load for ready-mixed concrete.
      c. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
      d. Ticket to show:
         1) Mix identification mark.
         2) Quantity delivered.
         3) Amount of each material in batch.
         4) Outdoor temp in the shade.
         5) Time at which cement was added.
         6) Numerical sequence of the delivery.
         7) Amount of water added.
   2. Reinforcing steel: Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
      a. Mark numbers to match shop drawing mark number.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   a. Nonshrink, nonmetallic grout:
   b. Sika "SikaGrout 212."
   c. Gifford Hill "Supreme Grout."
   d. Master Builders "Masterflow 713."
   2. Epoxy grout:
      a. Master Builders "Brutem MPG."
      b. Euclid Chemical Company, "High Strength Grout."
      c. Fosroc, "Conbextra EPHF".
   3. Expansion joint fillers:
      a. Permaglaze Co.
      b. Rubatex Corp.
      c. Williams Products, Inc.
   4. Waterstops, PVC:
      a. Greenstreak Plastic Products, Inc.
      b. W.R.Meadows, Inc.
      c. Burke Company.
   5. Form coating:
      a. Richmond "Rich Cote."
      b. Industrial Lubricants "Nox-Crete Form Coating."
      c. Protex "Pro-Cote."
   6. Prefabricated forms:
      a. Simplex "Industrial Steel Frame Forms."
      b. Symons "Steel Ply."
      c. Universal "Uniform."

2.2 MATERIALS

A. Portland Cement: Conform to ASTM C150. Type II.

B. Fly Ash:
   1. ASTM C618, Class F or Class C.
   2. Nonstaining.
      a. Hardened concrete containing fly ash to be uniform light gray color.

3. Maximum loss on ignition: 4 percent.
4. Compatible with other concrete ingredients.
5. Obtain proposed fly ash from a source approved by the State Highway Department in the state where the Project is located for use in concrete for bridges.

C. Admixtures:
1. Air entraining admixtures: ASTM C260.
2. Water reducing, retarding, and accelerating admixtures:
   a. ASTM C494 Type A through E.
   b. Conform to provisions of ACI 212.3R.
   c. Do not use retarding or accelerating admixtures unless specifically approved in writing by Engineer and at no cost to Owner.
   d. Follow manufacturer's instructions.
   e. Use chloride free admixtures only.
3. Maximum total water soluble chloride ion content contributed from all ingredients of concrete including water, aggregates, cementitious materials and admixtures by weight percent of cement:
   a. 0.10 all concrete.
4. Do not use calcium chloride.
5. Pozzolanic admixtures: ASTM C618.
6. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in the mix design.

D. Water: Potable, clean, free of oils, acids, alkalis, and organic matter.

E. Aggregates:
1. Normal weight concrete: ASTM C33, except as modified below.
2. Fine aggregate: Clean natural sand.
   a. No manufactured or artificial sand.
3. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material.
   a. Maximum amount of clay or shale particles: 1 percent.
4. Gradation of coarse aggregate:
   a. Lean concrete and concrete topping: Size #7.
   b. All other concrete: Size #57 or #67.

F. Concrete Grout:
1. Nonshrink nonmetallic grout:
   a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
   b. Grout to produce a positive but controlled expansion.
   c. Mass expansion not to be created by gas liberation.
   d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.

2. Epoxy grout:
   a. 3-component epoxy resin system.
      1) Two liquid epoxy components.
      2) One inert aggregate filler component.
   b. Each component packaged separately for mixing at jobsite.

G. Reinforcing Steel:
1. ASTM A615, Grade 60.

H. Forms:
1. Prefabricated or job built.
2. Wood forms:
   a. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
   b. Built-in-place or prefabricated type panel.
   c. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire area.

d. When approved, plywood may be reused.

3. Metal forms:
   a. Metal forms excluding aluminum may be used.
   b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
4. Chamfer strips: Clear white pine, surface against concrete planed.
5. Form ties: Removable end, permanently embedded body type with cones on outer ends not requiring auxiliary spreaders.
   a. Cone diameter: 3/4 IN minimum to 1 IN maximum.
   b. Embedded portion 1 IN minimum back from concrete face.
   c. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.
6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete surface.

I. Waterstops:
1. Plastic: Corp of Engineers Specification CRD-C572.
2. Serrated with center bulb.
3. Thickness: 3/8 IN.
4. Length (general use): 6 IN unless indicated otherwise.
5. Provide hog rings or grommets spaced at maximum 12 IN OC along the length of the water stop.
6. Provide factory made waterstop fabrications at all changes of direction, intersections and transitions leaving only straight butt splices for the field.

J. Waterstops, Preformed – Strip Type:
1. Manufacturers:
   a. Hydrotite CJ by Greenstreak Plastics, Inc.
   b. Synko Flex.
   c. Volclay Waterstop Rx.
2. Materials:
   a. Hydrophilic type waterstop manufactured solely for the purpose of preventing water from traveling through construction joints.
   b. Hydrotite type CJ-0725-3K or approved equal.

K. Chairs, Runners, Bolsters, Spacers, and Hangers:
1. Stainless steel, epoxy coated, or plastic coated metal.
   a. Plastic coated: Rebar support tips in contact with the forms only.

L. Membrane Curing Compound: ASTM C309, Type I-D.
1. Resin based, dissipates upon exposure to UV light.
2. Curing compound shall not prevent bonding of any future coverings, coatings or finishes.
3. Curing compounds used in water treatment plant construction to be nontoxic and taste and odor free.

M. Expansion Joint Filler:
1. Exterior driveways, curbs and sidewalks:
   a. Asphalt expansion joint filler.
   b. ASTM D994.
2. Other use:
   a. Fiber expansion joint filler.
   b. ASTM D1751.

2.3 CONCRETE MIXES

A. General:
1. All concrete to be ready mixed concrete conforming to ASTM C94.
2. Provide concrete of specified quality capable of being placed without segregation and, when cured, of developing all properties required.

3. All concrete to be normal weight concrete.

B. Strength:
1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
Concrete fill + Lean concrete	Normal weight	2500 psi
Precast concrete	Normal weight	5000 psi
All other general use concrete	Normal weight	4000 psi

* Minimum 28-day compressive strength when tested in accordance with ASTM C39.

C. Air Entrainment: Provide air entrainment in all concrete resulting in a total air content percent by volume as follows:

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	6 +/- 1.5
1/2 IN	6 1/2 +/- 1.5

1. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

D. Slump: 4 inch maximum, 1 inch minimum.
1. Measured at point of discharge of the concrete into the concrete construction member.
2. Concrete of lower than minimum slump may be used provided it can be properly placed and consolidated.
3. Pumped concrete:
   a. Provide additional water at batch plant to allow for slump loss due to pumping.
   b. Provide only enough additional water so that slump of concrete at discharge end of pump hose does not exceed maximum slump specified above.
4. Determine slump per ASTM C143.

E. Selection of Proportions:
1. General - Proportion ingredients to:
   a. Produce proper workability, durability, strength, and other required properties.
   b. Prevent segregation and collection of excessive free water on surface.
2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:

MINIMUM CEMENT, LB/CY				MAXIMUM WATER
SPECIFIED STRENGTH	MAXIMUM 1/2	AGGREGATE 3/4	SIZE, IN 1	CEMENT RATIO BY WEIGHT
4000	564	564	564	0.42

3. Substitution of fly ash:
   a. Maximum of 25 percent by weight of cement at rate of 1 LB fly ash for 1 LB of cement.
4. Sand cement grout:
   a. Three parts sand.
   b. One part Portland cement.
   c. Entrained air: Six percent plus or minus one percent.
   d. Sufficient water for required workability.
   e. Minimum 28-day compressive strength: 3,000 psi.
5. Normal weight concrete: Proportion mixture to provide desired characteristics using one of methods described below:

a. Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
   1) Air content within range specified above.
   2) Record and report temperature of trial mixes.
   3) Proportion trial mixes per ACI 211.1.
b. Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
   1) Field test records must be acceptable to Engineer to use this method.
   2) Test records shall represent materials, proportions and conditions similar to those specified.

6. Required average strength to exceed the specified 28-day compressive strength by the amount determined or calculated in accordance with the requirements of Paragraph 5.3 of ACI 318 using the standard deviation of the proposed concrete production facility as described in Paragraph 5.3.1 of ACI 318.

F. Flowable Fill:
1. Flowable fill shall be of cement, fly ash (or GGBFS), fine sand, water and air having a consistency which will flow under a very low head.
2. Approximate quantities of each component per cubic yard of mixed material:
   a. Cement (Type I or Type II): 50 LBS.
   b. Fly ash: 200 LBS.
   c. Fine sand: 2,700 LBS.
   d. Water (approximate): 420 LBS.
   e. Air content (approximate): 10 percent.
3. Actual quantities shall be adjusted to provide a yield of 1 CY with the materials used.
4. Approximate compressive strength should be 85 to 175 psi.
5. Fine sand shall be an evenly graded material having not less than 95 percent passing the No 4 sieve and not more than 5 percent passing the No. 200 sieve.

G. Fiber Reinforced Concrete:

1. Fiber Reinforced Concrete; A.S.T.M. C-1116 and shall be 100% virgin homopolymer polypropylene monofilament fibrous reinforcement as manufactured by FORTA ECONO – MONO.

Minimum fiber dosage rate of 1.0 LBS/CY, with a fiber length of ¾ inch.

This design mix has a Mix ID# 4035A6; Registered with Carolina Concrete, Newberry, SC

2. Approximate quantities of each component per cubic yard of mixed material (4,000 psi)

a. Cement (Type 1): 525 LBS

b. Fly ash class F: 100 LBS

c. Fine sand: 405 LBS

d. Coarse sand (Enoree sand): 606 LBS

e. Coarse Aggregate (57 stone): 1877 LBS

f. Water: 33gal/275.22LBS

g. Air content: 6% by volume +/- 1.5%

h. W/C Ratio :0.43

PART 3 - EXECUTION

3.1 FORMING AND PLACING CONCRETE

A. Formwork:
1. Contractor is responsible for design and erection of formwork.

2. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation and position.
   a. Allowable tolerances: As recommended in ACI 347R.
3. Provide slabs of minimum indicated depth when sloping foundation base slabs to drains.
   a. For slabs on grade, slope top of subgrade to provide floor slabs of minimum uniform indicated depth.
4. Openings: Provide openings in formwork to accommodate work of other trades.
   a. Accurately place and securely support items built into forms.
5. Chamfer strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges on permanently exposed corners of members.
6. Clean and adjust forms prior to concrete placement.
   a. Remove nails and thoroughly clean all surfaces in contact with concrete before reusing lumber in framework.
7. Tighten forms to prevent mortar leakage.
8. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.

B. Reinforcement:
1. Position, support and secure reinforcement against displacement.
2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed concrete surfaces.
4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on the Drawings.
5. Extend reinforcement to within 2 IN of concrete perimeter edges.
   a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
6. Minimum concrete protective covering for reinforcement.
7. Unless otherwise indicated, provide minimum concrete cover as follows:
   a. Concrete deposited against earth: 3 IN.
   b. Formed surfaces exposed to weather or in contact with earth: 2 IN for reinforcing bars #6 or larger; 1-1/2 IN for reinforcing bars less than #6.
   c. Formed surfaces exposed to or located above any liquid: 2 IN
   d. Interior surfaces: 1-1/2 IN for beams, girders and columns; /4 IN or bar diameter, whichever is greater, for slabs, walls and joists.
8. Do not weld reinforcing bars.

C. Construction, Expansion, and Contraction Joints:
1. Provide at locations indicated.
2. Locate construction joints in floor slabs and foundation base slabs so that concrete placements are approximately square and do not exceed 2500 SF, unless otherwise specified.
3. Install construction joints perpendicular to main reinforcement with all reinforcement continued across construction joints.
4. At least 48 HRS shall elapse between placing of adjoining concrete construction.
5. Thoroughly clean and remove all laitance and loose and foreign particles from construction joints.
6. Before new concrete is placed, coat all construction joints with an approved bonding adhesive used and applied in accordance with manufacturer's instructions.

D. Embedments:
1. Set and build in anchorage devices and other embedded items required for other work that is attached to, or supported by concrete.
2. Use setting diagrams, templates and instructions for locating and setting.
3. Secure waterstops in correct position using hog rings or grommets spaced along the length of the waterstop and wire tie to adjacent reinforcing steel.

E. Placing Concrete:
1. Place concrete during daylight hours only.

2. Jobsite water addition will not be permitted if all approved mix water has been added at the plant.
3. Any jobsite water addition must be approved and witnessed by material testing firm representative and added water quantity noted on ticket and test report.
4. Place concrete in compliance with ACI 304R and 304.2R.
5. Place in a continuous operation within planned joints or sections.
6. Begin placement when work of other trades affecting concrete is completed.
7. Place concrete by methods which prevent aggregate segregation.
8. Do not allow concrete to free fall more than 4 FT.
9. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or chute.

F. Consolidation:
1. Consolidate all concrete using mechanical internal-vibrating equipment supplemented with hand rodding, tamping, and spading with a slicing rod, so that concrete is worked around reinforcement and embedded items into all parts of forms.

G. Protection:
1. Protect concrete from physical damage or reduced strength due to weather extremes.
2. In cold weather comply with ACI 306R except as modified herein.
   a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars coated with frost, ice or snow.
   b. Minimum concrete temperature at the time of mixing:

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Between 35-45 DegF	60 DegF
Above 45 DegF	50 DegF

   c. Do not place heated concrete that is warmer than 80 DegF.
   d. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 DegF for 7 days or 70 DegF for 3 days.
3. Do not place concrete when atmospheric temperature is below 35 DegF.
   a. If temperature drops below 35 DegF after concrete is placed, then enclose, heat and protect the concrete.
4. Do not place earth fill on concrete until concrete has been allowed to set for 24 hours.
5. Do not allow concrete to cool suddenly.
6. In hot weather comply with ACI 305R except as modified herein.
   a. At air temperature of 90 DegF and above, keep concrete as cool as possible during placement and curing.
   b. Do not allow concrete temperature to exceed 90 DegF at placement.
   c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
   d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

H. Curing:
1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by membrane curing compound.
3. Provide protection as required to prevent damage to concrete and to prevent moisture loss from concrete during curing period.
4. Provide curing for minimum of 7 days.
5. Form materials left in place may be considered as curing materials for surfaces in contact with the form materials except in periods of hot weather.
6. In hot weather follow curing procedures outlined in ACI 305R.
7. In cold weather follow curing procedures outlined in ACI 306R.

8. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of above methods for the remainder of the curing period.
9. Curing vertical surfaces with a curing compound: Cover vertical surfaces with a minimum of two coats of the curing compound applied at 90 degrees to one another.
    a. Allow the preceding coat to completely dry prior to applying the next coat.
    b. Apply the first coat of curing compound immediately after form removal.
    c. Vertical surface at the time of receiving the first coat shall be damp with no free water on the surface.
    d. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

I. Form Removal:
1. Remove forms after concrete has hardened sufficiently to resist damage from removal operations or lack of support.
2. Under normal conditions, do not remove forms until the following time has elapsed:
    a. Slabs: 14 days
    b. Piers: 7 days
    c. Walls: 2 days

3.2 CONCRETE FINISHES

A. Tolerances: All work shall comply with:
1. Class B: 1/4 IN maximum in 10 FT.

B. Surfaces Exposed to View:
1. Provide a smooth finish for exposed concrete surfaces and surfaces that are:
    a. To be covered with a coating or covering material applied directly to concrete.
    b. Scheduled for grout cleaned finish.
2. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with cement grout.
3. Fill tie holes with nonshrink nonmetallic grout.

C. Surfaces Not Exposed to View:
1. Patch voids, air pockets and honeycomb areas with cement grout.
2. Fill tie holes with nonshrink nonmetallic grout.

D. Grout Cleaned Finish:
1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient bonding agent/water mixture to produce a grout with the consistency of thick paint.
    a. White Portland cement shall be substituted for gray Portland cement to produce a color that matches color of surrounding concrete as determined by trial patch for areas not to be painted.
2. Wet surface of concrete to prevent absorption of water by grout and uniformly apply grout with brushes or spray gun.
3. Immediately scrub the surface with a cork float or stone to coat and fill air bubbles and holes.
4. While grout is still plastic, remove all excess grout by working surface with rubber float, sack or other approved means.
5. After the surface whitens from drying, rub vigorously with clean burlap.
6. Keep final finish damp for a minimum of 36 HRS after final rubbing.

E. Slab Float Finish:
1. This finish shall be applied to all new slab areas. DO NOT overwork finishing this area.
2. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
3. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operations. Use wood or cork float.
4. During or after first floating, check planeness of entire surface with a 10 FT straightedge applied at not less than two different angles.

5. Cut down all high spots and fill all low spots to produce a surface with Class B tolerance throughout.
6. Refloat slab immediately to uniform texture.

F. Troweled Finish:
1. Float finish surface.
2. Next power trowel, and finally hand trowel.
3. Produce a smooth surface which is relatively free of defects with first hand troweling.
4. Perform additional trowelings by hand after surface has hardened sufficiently.
5. Final trowel when a ringing sound is produced as trowel is moved over surface.
6. Thoroughly consolidate surface by hand troweling.
7. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
8. On surfaces intended to support floor coverings remove any defects of sufficient magnitude that would show through floor covering by grinding.

G. Broom Finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom across surface.

3.3 GROUT

A. Preparation:
1. Nonshrinking nonmetallic grout:
a. Clean concrete surface to receive grout.
b. Saturate concrete with water for 24 HRS prior to grouting.
2. Epoxy grout: Apply only to clean, dry, sound surface.

B. Application:
1. Nonshrinking nonmetallic grout:
a. Mix in a mechanical mixer.
b. Use no more water than necessary to produce flowable grout.
c. Place in accordance with manufacturer's instructions.
d. Completely fill all spaces and cavities below the bottom of baseplates.
e. Provide forms where baseplates and bedplates do not confine grout.
f. Where exposed to view, finish grout edges smooth.
g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate, bedplate, member, or piece of equipment.
h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
i. Wet cure grout for 7 days, minimum.

2. Epoxy grout:
a. Mix and place in accordance with manufacturer's instructions.
b. Completely fill all cavities and spaces around dowels and anchors without voids.
c. Obtain manufacturer's field technical assistance as required to ensure proper placement.

3.4 FIELD QUALITY CONTROL

A. The Contractor shall employ and pay for services of a concrete testing laboratory to perform testing of concrete placed during construction.

B. Concrete Quality Control During Construction:
1. Strength tests:
a. Secure concrete samples in accordance with ASTM C172.
b. Obtain each sample from a different batch of concrete on a random basis with at least one sample obtained for every 100 cubic yards of concrete used.
c. For each strength test mold and cure four cylinders from each sample in accordance with ASTM C31.
1) Record any deviations from requirements on test report.
d. Test cylinders in accordance with ASTM C39.

1) Test 1 cylinder at 7 days.
2) Test 2 cylinders at 28 days.
3) Hold one cylinder in reserve.

2. Provide strength tests as follows:
   a. One strength test consisting of 6 IN DIA x 12 IN high cylinders shall be taken:
      1) Not less than one test each day concrete placed.
      2) Not less than one test for each 50 CY or fraction thereof placed in 1 day.
      3) Not less than one test for each type of concrete poured.
      4) Not less than one test for each concrete structure exceeding 2 CY in volume.
3. Determine slump of concrete sample for each strength test.
   a. Additional slump tests shall be taken if consistency of concrete appears to vary.
   b. Determine slump in accordance with ASTM C143.
4. Determine air content of concrete sample for each strength test in accordance with either ASTM C231, C173, or C138.
5. Determine temperature of concrete sample for each strength test.
6. Determine unit weight (LB/CF) of fresh lightweight concrete at point of discharge into construction member for each strength test.
7. Submit results of all concrete strength tests to Engineer in writing as soon as tests are completed.

C. Evaluation of Tests:
   1. Strength test results: Average of 28-day strength of two cylinders from each sample.
      a. If one cylinder manifests evidence of improper sampling, molding, handling, curing or testing, strength of remaining cylinder will be test result.
      b. If both cylinders show any of above defects, test will be discarded.

D. Acceptance of Concrete:
   1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
      a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
      b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
   2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
      a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.5 SCHEDULES

A. Form Types:
   1. Surfaces exposed to view:
      a. Prefabricated or job-built wood forms.
      b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
      c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
      d. Construct forms sufficiently tight to prevent leakage of mortar.
   2. Surfaces not normally exposed to view:
      a. Wood or steel forms sufficiently tight to prevent leakage of mortar.
   3. Other types of forms may be used:
      a. For surfaces not restricted to plywood or lined forms.
      b. As backing for form lining.

B. Grout:
   1. Nonshrinking nonmetallic grout: General use.
   2. Below steel baseplates.
   3. Epoxy grout:
      a. Grouting of dowels and anchor bolts into existing concrete.

b. Other uses indicated on Drawings.

4. Sand cement grout: Repairs of surface defects.

C. Concrete:
   1. Precast concrete: Where indicated on Drawings.
   2. Lean fill concrete: Where indicated on Drawings.
   3. Normal weight concrete: All other concrete.

D. Concrete Finishes:
   1. Grout cleaned finish: Exposed vertical surfaces.
   2. Slab finishes:
      a. Use following finishes as applicable, unless otherwise indicated:
         1) Floated finish: Exterior slabs.
         2) Troweled finish: Other interior floor slabs, and base slabs of structures, equipment bases, and column bases.
         3) Broom finish: Sidewalks and ramps.

END OF SECTION

SECTION 31 01 40
SHEETING AND SHORING

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes the furnishing of all labor, materials, tools and equipment necessary to prevent cave-in of excavations and trench walls or settlement of areas adjacent to excavations and trench walls.

B. No additional compensation shall be made for sheeting and shoring required under this contract.
   1. Applicable costs for sheeting and shoring shall be included in the aggregate cost of the work items to which the sheeting and shoring are incidental or appurtenant.

1.2 GENERAL REQUIREMENTS

A. The Contractor shall provide and install such sheeting and shoring as may be required to support the sides of any excavation to prevent earth movement that could endanger the work or workmen, or any existing structures, or to confine the construction within a specified, permitted and/or indicated typical trench cross- section or to within specific construction limits including defined easements or street rights-of-way.

B. It shall be the Contractor's responsibility to furnish, place and maintain sheeting and shoring when and where required by applicable federal, state and local laws and regulations.

C. Neither the presence nor observation by the Engineer or Owner shall excuse the Contractor in any way from his responsibility to provide required sheeting and shoring necessary for the protection of life and property during construction. Job and site safety shall be and remain the sole responsibility of the Contractor for the duration of the Construction Contract.

D. All sheeting and shoring systems must be sealed by a South Carolina Licensed Professional Engineer.

1.3 RELATED WORK

A. Section 31 23 19 - Dewatering

B. Section 31 23 33 - Tank Backfilling and Compacting for Utilities

C. Section 32 91 13 - Topsoiling and Finished Grading

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel or wood sheeting may be used at the Contractor's option. Sheeting shall be of adequate strength for the purpose intended.

B. Steel drag shields or trench boxes may also be used subject to the written approval of the Engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall provide and install all sheeting and shoring as required by applicable regulatory authority, i.e. OSHA, etc. Such sheeting and shoring will be considered as being for Contractor's convenience and benefit; all costs for furnishing, installing and removing same shall be borne by the Contractor.

B. Steel sheeting may be completely removed when sufficient backfill has been placed to prevent damage to the work and/or existing structures. Care shall be exercised to prevent opening of voids during the extraction process.

C. Unless approved otherwise in writing by the Engineer, all timber sheeting shall be cut off 30 inches below grade and left in place with proper bracing to provide lateral support.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Site clearing, tree protection, stripping topsoil and demolition.

B. Related Sections include but are not necessarily limited to:
   1. Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 32 91 13 – Topsoiling and Finished Grading.
   4. Section 31 25 00 - Soil Erosion and Sediment Control.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)

PART 3 - EXECUTION

3.1 PREPARATION

A. Contractor should review clearing limits with Engineer prior to clearing.

B. Protect existing trees and other vegetation to remain against damage.
   1. Do not smother trees by stockpiling construction materials or excavated materials within drip line.
   2. Avoid foot or vehicular traffic or parking of vehicles within drip line.
   3. Provide temporary protection as required.

C. Repair or replace trees and vegetation damaged by construction operations.
   1. Repair to be performed by a qualified tree surgeon.
   2. Remove trees which cannot be repaired and restore to full-growth status.
   3. Replace with new trees of minimum 4 IN caliper.

D. Owner will obtain authority for removal and alteration work on adjoining property.

3.2 SITE CLEARING

A. Topsoil Removal:
   1. Strip topsoil to depths encountered.
      a. Remove heavy growths of grass before stripping.
      b. Stop topsoil stripping sufficient distance from such trees to prevent damage to main root system.
      c. Separate from underlying subsoil or objectionable material.
   2. Stockpile topsoil where directed.
      a. Construct storage piles to freely drain surface water.
      b. Seed or cover storage piles to prevent erosion.
   3. Do not strip topsoil in wooded areas where no change in grade occurs.
   4. Borrow topsoil:
      a. Reasonably free of subsoil, objects over 2 IN DIA, weeds and roots.

B. Clearing and Grubbing:
   1. Clear from within limits of construction all trees not marked to remain.

a. Include shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds, vines, rubbish, structures and debris.

2. Grub (remove) from within limits of construction all stumps, roots, root mats, logs and debris encountered.
   a. Grubbing under areas to be paved:
      1) Totally grub.
   b. Grubbing in lawn areas:
      1) In cut areas, totally grub.
      2) In fill areas, where fill is less than 3 FT totally grub ground.
      3) Where fill is 3 FT or more in depth, stumps may be left no higher than 6 IN above existing ground surface.

C. Removal of Private or Public Facilities:
   1. Promptly replace any private or public facilities, including fences and drainage features (existing driveway piping & drainage conveyance systems), which are removed for construction purposes.
   2. Do not disturb trees or shrubbery along highways, roadways, or streets unless absolutely necessary and approved by Owner. Heel in and replant, under the direction of an experienced nurseryman, any trees or shrubbery that must be removed.

D. Disposal of Waste Materials:
   1. Do not burn combustible materials on site.
   2. Remove and legally dispose all waste materials from site.
   3. Do not bury organic matter on site.

3.3 ACCEPTANCE

A. Upon completion of the site clearing, obtain Engineer's acceptance of the extent of clearing, depth of stripping and rough grade.

END OF SECTION

SECTION 31 23 19
DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Dewatering – definition responsibilities and execution.

B. Related Sections include but are not limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and General Conditions.
   2. Division 01 – General Requirements.
   3. Division 31 – Site Clearing.

1.2 QUALITY ASSURANCE

A. Qualifications.
   1. The dewatering system shall be designed by a registered professional engineer in the State of South Carolina specializing in groundwater control.

1.3 DEFINITIONS

A. Dewatering: Consists of the design, furnishing, installation, operation, maintenance, monitoring, reporting, and removal of dewatering system(s) to achieve completion of all work performed under this Contract without damage to adjacent improvements or property.

1.4 SUBMITTALS

A. Drawings and complete design data showing methods and equipment proposed to be utilized in dewatering, including relief of hydrostatic head as necessary to allow the excavation and construction of the pumping station structures.

B. As a minimum, submit the following for each dewatering system utilized:
   1. Drawings indicating the location and size of deep wells, observation wells, wellpoints, sumps, vacuum headers, flow rate meters, discharge lines, silt tanks, recharge systems, groundwater cutoff systems, and any other groundwater control system component.
   2. Capacities and details of pumps, prime movers, and standby equipment.
   3. Design calculations proving adequacy of system and selected equipment, including well screen slot sizes and filter pack calculations.
   4. Detailed description of the dewatering schedule, operation, maintenance, and well abandonment procedures.
   5. Projected drawdown in wells with elevations.
   6. Plan view drawing indicating estimated zone of influence with groundwater elevations.
   7. Monitoring plan for adjacent utilities and structures.
   8. Detailed description of methods for controlling settlement of existing utilities and structures.
   9. Estimated dewatering system discharge flow rate.
   10. Test methods, equipment, and schedule for monitoring discharge quality.
   11. Erosion and Sediment Control Plan for the dewatering discharge.

C. Coordinate and submit dewatering plan concurrent with submittals specified in Section 31 23 33.

D. Submit well completion as built location and boring logs within 5 days of installation.

E. Company name, address, phone numbers of the licensed well driller in the State of South Carolina planned for installation and abandonment of the dewatering and observation wells.

F. Throughout the duration of construction, the Contractor shall submit weekly reports on daily dewatering and disposal operations. The reports shall present the following information:
   1. Number of wells in operation for each system.

2. Average rate of water pumped from each dewatering system.
3. Total volume of water disposed of from the date of the last report to the date of the current report.
4. Description of any problems with dewatering equipment or operations.
5. Water level elevation in each monitoring well and each pumping well.
6. Water quality measurements including those listed for discharge.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Dewatering Equipment:
   1. The Contractor shall provide a complete dewatering system including pumps, well equipment, power supply, and all other miscellaneous items required for a complete installation and operation of the dewatering system.

B. Dewatering Effluent Piping:
   1. Suitable for terrain, required pumping pressures and construction traffic impact.

C. Standby Equipment:
   1. Maintain on site sufficient equipment and materials for necessary modifications and to ensure continuous and successful operation of the dewatering and monitoring systems for all ordinary emergencies including power outage and flooding.
   2. Provide one hundred percent standby electrical generating capacity with automatic switching from line to generator, including all safety features to prevent back-feeding the electrical supply system.
   3. Provide at least 25 percent standby pumps or provide contingency detail for delivery of additional pumps to the site within 24 hours.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS.

A. General:
   1. Contractor shall maintain dewatering system such that it is in continuous operation without any interruptions.
   2. Dewatering water will not be discharged directly into surface water bodies.
      a. Dewatering water shall be discharged as follows:
         1) Through an on-site constructed sediment trap
         2) Through proper erosion and sediment control devices
   3. Supply a separate electrical service for dewatering and dedicate it solely to the operation of the dewatering systems.
   4. Control groundwater such that the potential for "flowing" conditions is mitigated by lowering the groundwater a minimum 3 feet below pumping station bottom slab, and prevent formation of "quick" conditions or "boils" during excavation.
   5. Maintain water levels a minimum of 2 feet below the bottom of all excavations at all times and under all conditions.
   6. Keep excavations free of water during excavation, construction of structures, installation of pipelines, placing of materials described in Section 31 23 33.
   7. Control surface runoff so as to prevent entry or collection of water in excavations or in other isolated areas of the site.
   8. The dewatering system will include any deep wells, well points, pumps, and other equipment, appurtenances, and related earthwork necessary to perform the function.
   9. Design and operate dewatering systems so as to prevent removal of the natural soils.
   10. Do not start dewatering prior to the Engineer's review and acceptance of the method, installation, and details of the proposed dewatering system.
   11. All wells shall be installed and abandon by a licensed water well Contractor.
   12. Design and install the system to pipe the effluent to an area of the site to prevent flooding, pooling water, erosion, etc. to undisturbed areas of the site or adjacent property.

13. Drill, develop, operate, and abandon all wells in compliance with all regulatory agencies with jurisdiction.

B. Dewatering system protection:
   1. Wherever dewatering wells, vacuum headers or discharge lines are crossed for access and egress use steel ramps or other methods to protect the system from construction traffic.
   2. All ramps or other methods shall be capable of supporting the heaviest equipment on site. Provide at least one foot of clearance between the dewatering system element and the underside of the ramp.
   3. Valve all ramped pipelines on both sides of the ramp.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Dewatering system protection and dewatering effluent pipelines:
   1. Protect all dewatering wells throughout construction.
   2. Wells and dewatering effluent pipelines damaged during the construction shall be reinstalled and redeveloped at no additional cost to the Owner.

B. Standby Equipment:
   1. Maintain standby pumps fueled and in operational condition at all times.
   2. Test all standby pumps and generators weekly to ensure their immediate availability.

C. Maintain excavation in a dewatered condition continuously and without interruptions:
   1. System Maintenance:
      a. Provide standby and spare equipment of the same capacity and quantity as specified in Section 2.1.C.
      b. Any other work required to maintain the systems.
   2. Dewatering will be a continuous operation and shall not be interrupted due to power outages or any other reason.
   3. Do not shut down these systems between shifts, on holidays, or weekends, or during work stoppage without written permission from the Engineer.
   4. Restrain all pipe joints and fittings of the dewatering effluent pipelines.
   5. Subsequent to completion and acceptance of all work in the excavated area, maintain the dewatering systems in operation.

3.2 FIELD QUALITY CONTROL

A. General:
   1. Monitor dewatering effluent daily for odors or visual signs of contamination.
   2. Report all daily monitoring information to the Engineer on a weekly basis.

B. Observation wells:
   1. Number and obtain ground surface elevations for all monitor wells.
   2. Permanently mark measuring points on wells.
   3. Submit weekly summaries of daily water level measurements to the Engineer.

C. Dewatering Wells:
   1. Record and make available to the Engineer on a daily basis:
      a. The location and number of dewatering wells and sump pumps in operation.
      b. Total flow indicated on the flow meters.
      c. The rate of flow at the time of the recording.
   2. Consistency is an important factor in ensuring that water level data are accurate; therefore, assign and make known to the Engineer specific member(s) of workforce responsible for collecting and reporting the required information.

D. Perform any additional testing or monitoring as necessary to assure provision of a properly functioning dewatering system.

3.3 DEMOBILIZATION

A. Upon written authorization of the Engineer, remove all dewatering system elements with the exception of those observation wells so designated by the Engineer.

END OF SECTION

SECTION 31 23 33
TANK BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavation, tank stability, backfilling and covering of the underground FRP water storage tanks.
   2. FRP Water Storage Tanks, general installation process
   3. Bedding Preparation.
   4. All related utility and process appurtenances.

B. Related Sections include but are not necessarily limited to:
   1. Division 01 - General Requirements.
   2. Section 33 16 00 FRP Water Storage Tanks

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials (ASTM):

      a. D4914, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory plat compactor or a remote controlled walk-behind vibrating sheep's foot roller (Rammax).
      b. Relative compaction of 95% as determined by the Standard Test for Density (ASTM D-4914).

   2. SC DOT Standard Specifications for Roads and Structures.
   3. 29 CFR 1926 (OSHA) SUB PART (P) for class B soils.

B. Qualifications: Owner may hire an independent soils laboratory to conduct in-place moisture density tests for backfilling to assure that all work complies with this specification.

1.3 DEFINITIONS

A. Excavation:
   1. All excavation will be defined as unclassified.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Tank Manufacturer's installation instructions.
   3. Trench Safety Plan and/or trench shoring drawings including current certification of trench shields (trench boxes) if employed.
   4. Submit respective generalized installation process regarding bedding methods of installation and general installation recommendations.
   5. Submit sieve analysis reports on all back fill materials.

1.5 PROJECT CONDITIONS

A. Comply with all applicable County and State Department of Transportation regulations regarding construction operations, safety, traffic control, road maintenance, and repair.

B. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.

C. Provide full access to public and private premises and fire hydrants, at street crossings, sidewalks and other points as designated by Owner to prevent serious interruption of travel.

D. Protect and maintain bench marks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of Owner and controlling agency.

E. Before excavation for the tank installation, locate water, sewer, gas and other utilities' lines and services as necessary to avoid conflicts. Locate existing small lines, and other possible unknown utility lines, with an electronic pipe finder, and excavate and expose all existing underground lines in advance of trenching operations.

F. Take necessary precautions to protect existing utilities from damage due to construction operations. At Contractor's expense, repair or replace existing utility lines, services, poles, and structures damaged by the work of locating services or by the construction operations. Assess no cost to Owner, Engineer, or auxiliary party for any damages. The approximate positions of certain known underground lines are shown for information.

G. A pump of sufficient size to expeditiously remove collecting water should be employed if ground water intrusion is encountered.

H. Excavations shall not remain open longer than 24 hours without placing bedding and backfill material. Under no circumstances should an excavation remain open over a weekend, holiday or other extended time away from the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Material:
   1. As approved by the FRP Water Storage Tank Manufacturer and or Engineer.
      a. Free of rock cobbles, roots, sod or other organic matter, and frozen material.
      b. Moisture content at time of placement: 3 percent plus/minus of optimum moisture content as specified in accordance with ASTM D698.
      c. Reinstalled and Compacted stockpiled excavated unclassified soils.

B. Bedding Materials:
   1. As approved by the Soils Engineer and in accordance with the FRP Water Storage Tank Manufactures Installation Manual and or recommendations.
   2. Bedding materials:
      a. ASTM C33, gradation #57 consisting of clean, naturally rounded aggregate with a mix of particle size not less than ¼" or more than ½".No more than 5% may pass the #8 sieve and its dry density with a minimum of 100 lbs/cubic foot.
      b. Crushed stone may be used if approved by the tank manufacturer and the Engineer. It must be washed with an angular particle size of not less than ¼" and more than ½". No more than 5% may pass the #8 sieve and the dry stone density of 100 lbs/cubic foot.

   3. Subgrade stabilization materials: The subgrade should be prepared by removing all loose soil, organics, and/or other deleterious materials from the base of the excavation. Should the subgrade not be able to be compacted to 95% as determined by ASTM D-4914, The Contractor shall provide #67 clean, washed crushed stone. A minimum of 8" of #67 stone shall be excavated for and compacted in place and brought up to the bottom of the excavation.

PART 3 - EXECUTION

3.1 GENERAL

1. Remove and dispose of unsuitable materials as directed by Soils Engineer to site provided by Contractor.
2. Stock Pile unclassified materials for use in the backfilling procedure and use by the property owns and or Newberry County.

3.2 EXCAVATION

A. FRP Water Storage Tank Excavation:
   1. Tank Excavation by open cut method to depth and dimensions shown on Drawings and necessary to accommodate work.
   2. General Installation Process: Contractor shall follow manufacturer's recommended installation procedure.

3.3 PREPARATION OF FOUNDATION FOR FRP WATER STORAGE TANK

A. Over-Excavation:
   1. Backfill and compact to 95 percent of maximum dry density per ASTM D698.
   2. Backfill with pea gravel bedding material as option.

B. Rock Excavation:
   1. Remove rock excavation and dispose of to a site approved by the Owner. Rock excavation shall be carried twelve (12) inches below the FRP Water Storage Tank foundation bottom. The tank shall then be bedded as shown on the approved FRP Water Storage Tank manufacturers shop drawings and brought back to grade with suitable materials, properly compacted.
   2. Blasting is prohibited at all site locations.
      a. Use of jackhammers and excavators with rock removal accessories will be used to remove rock in all cases and adjacent to existing utilities, buildings and structures.

C. Dewatering:
   1. The Contractor shall at all times provide and maintain ample means and equipment with which to remove and properly dispose of any and all water entering the excavation or other parts of the Work and keep all excavations dry until such time as the subgrade preparation and bedding materials and deadmen anchors and grading is complete and water storage tank to be installed therein are completed.
   2. All water pumped or drained from the Work shall be disposed of in such a manner as to prevent siltation and erosion to adjacent property or other construction.

D. Shoring and Shielding:
   1. The Contractor shall comply with OSHA trenching and excavation regulations as revised in Subpart P of Part 1926 in the Federal Register. Shoring and/or shielding systems shall be used as specified in Subpart P to prevent caving of trench banks and to provide a safe excavation.
   2. The Contractor will be responsible for excavation safety and shall designate his "competent person" (as defined in Subpart P) for the determination of proper shielding/shoring systems.

E. Subgrade Stabilization:
   1. Stabilize the subgrade when directed by the Owner.
   2. Observe the following requirements when unstable trench bottom materials are encountered.
      a. Notify Owner when unstable materials are encountered.
         1) Define by drawing station locations and limits.
      b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
         1) Replace with subgrade stabilization with no additional compensation.

3.4 BACKFILLING METHODS

A. Carefully Compacted Backfill:
   1. Furnish where indicated on drawings, specified for embedment conditions and for compacted backfill conditions up to 36 inches above the top of the tank.
   2. Comply with the following:
      a. Place gravel backfill in lifts not exceeding 12 IN (loose thickness) to a minimum of 1-foot higher than the top of the water tank elevation.
      b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
      c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
      d. Compact each lift to specified requirements.
      e. It is recommended that the gravel backfill is placed using chute, rather than directly dumping to direct the gravel into the excavation without damaging the tank.
      f. When using the unclassified in-situ soil as backfill once the gravel backfill has reached a height of 1- foot above the top of the tank and prior to placement of any soil, a non-woven geotextile separation fabric, US Fabrics US-180NW or equivalent shall be installed in accordance with the drawings and tank manufacture installation procedures.

B. Common Unclassified Stockpiled Backfill:
   1. Perform in accordance with the following:
      a. Place backfill in lift no greater than 8" thicknesses capable of being compacted to densities specified.
      b. Observe specific manufacturer's recommendations regarding backfilling and compaction.

C. Water flushing for consolidation is not permitted.

3.5 COMPACTION

A. General:
   1. Place and assure bedding, backfill, and fill materials achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work.
   2. In no case shall degree of compaction below "Minimum Compaction" specified be accepted.

B. Compaction Requirements: Unless noted otherwise on Drawings or more stringently by other sections of these Specifications, comply with following trench compaction criteria:

C. Bedding shall encapsulate the tank as recommended by the tank manufacturer. The bedding material compaction shall be accomplished by (Hand Probing) to consolidate the gravel backfill under the fiberglass tank. A minimum of 12" of bedding material will be required under the tank.

3.6 USE OF EXPLOSIVES

A. Blasting with any type of explosive is prohibited.

3.7 FIELD QUALITY CONTROL

A. Testing:
   1. Perform in-place moisture-density tests as directed by the Engineer (assume 2 per tank).
   2. Perform tests through recognized testing laboratory approved by Owner.
   3. Costs of "Passing" tests paid by Contractor.
   4. Perform additional tests as directed until compaction meets or exceeds requirements.
   5. Cost associated with "Failing" tests shall be paid by Contractor.
   6. Reference to Engineer in this section will imply Soils Engineer when employed by Owner and directed by Engineer to undertake necessary inspections as approvals as necessary.
   7. Assure Owner has immediate access for testing of all soils related work.
   8. Ensure excavations are safe for testing personnel.

END OF SECTION

SECTION 32 12 16
ASPHALTIC CONCRETE VEHICULAR PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphaltic concrete vehicular paving (asphalt paving).

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and General Conditions.
   2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Construction standards: State of South Carolina Department of Transportation, "Standard Specifications for Highway Construction, 2007 Edition".
   2. American Association of State Highway and Transportation Officials (AASHTO).
   3. American Society for Testing and Materials (ASTM).
      a. D4253, Standard Test Methods for Maximum Index Density of Soils Using a Vibratory Table.

B. Miscellaneous:
   1. Should conflicts arise between standard specifications of government agencies mentioned herein and Contract Documents, Contract Documents shall govern.

1.3 SUBMITTALS

A. Shop Drawings:
   1. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
   2. Asphalt design mix.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bituminous Concrete: In accordance with SCDOT specifications.

B. Aggregate Base Course: In accordance with SCDOT specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Subgrade Preparation:
   1. Prepare using methods, procedures, and equipment necessary to attain required compaction densities.
   2. Scarify and compact top 6 IN of fills and embankments, which will be under paved areas.
   3. Remove soft or spongy areas. Replace with material acceptable to the Engineer.
   4. Compact to the following densities:
      a. Cohesive soils: 95 percent per AASHTO T99.

b. Non-cohesive soils: 75 percent relative per ASTM D4253.

5. Assure moisture content is within limits prescribed to achieve required compaction density.
6. Following compaction, trim and roll to exact cross section. Check with approved grading template.
7. Density tests will be performed by Owner's testing laboratory as directed by Engineer on subgrade to determine that subgrade complies with the specifications.

B. Construct to line, grade and section as shown on Drawings and in accordance with referenced State Specifications.
   1. Proof-roll subgrade prior to placing base course.
   2. Repair subgrade as required.
   3. On properly compacted subgrade, install compacted layer of aggregate base course.
   4. On properly prepared aggregate base course, install compacted layers of bituminous concrete.

C. Install compacted layer of soil aggregate base in accordance with Section 302 of the SCDOT Specifications.

D. Install hot mix asphalt intermediate course Type B in accordance with Division 400 of SCDOT Specifications.

E. Install hot mix asphalt surface course, Type B in accordance with Division 400 of SCDOT Specifications and as shown on the Drawings.

F. Tolerance of Finished Grade: $\pm$ 0.10 FT from required elevations.

G. Eliminate areas where ponding occurs.

H. Opening to Traffic:
   1. Contractor shall install barricades or other items to prevent traffic and/or disturbances to pavement.
   2. Opening to traffic shall occur only after Engineer approval of construction and only as directed by Engineer.

END OF SECTION

SECTION 31 25 00
SOIL EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Soil erosion and sediment control.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 01 - General Requirements.
   3. Section 32 92 00 – Seeding, Sodding and Landscaping.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. Erosion control standards: "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas" by the U.S. Department of Agriculture, Soil Conservation Service, College Park, Maryland.
   2. The SC DHEC regulations for stormwater discharges from construction activities.

1.3 DEFINITIONS

A. Temporary Diversions: A temporary ridge or excavated channel or combination ridge and channel constructed across sloping land on a predetermined grade.

B. Fabric Drop Inlet Protection (Temporary): A temporary fabric barrier placed around a drop inlet.

C. Temporary Sediment Trap: A small, temporary ponding basin formed by an embankment or excavation to capture sediment.

D. Sediment Fence (Silt Fence): A temporary sediment barrier consisting of filter fabric buried at the bottom, stretched, and supported by posts.

E. Rock Ditch Check: Small temporary stone dams constructed across a drainage way.

F. Seeding: Preparation of topsoil and planting of vegetation to prevent soil erosion.

G. Culvert Inlet Protection: Rock embankment located to prevent a drainage pipe inlet from becoming blocked by sediment.

H. d50: A mixture of stones in which 50% of the stone by weight would be smaller than the diameter specified.

1.4 BORROW AREAS, SPOIL AREAS AND OTHER AREAS DISTURBED BY CONSTRUCTION

A. The Contractor shall furnish, install, maintain, inspect and if necessary replace all erosion control and sediment control measures in accordance with referenced standards and these specifications.

1.5 NONCOMPLIANCE

A. Implement any corrective actions when directed by OWNER.

B. Failure to comply with this Section is grounds for temporary suspension of the Work.

1. Temporary suspension, when invoked, will be effective until satisfactory installation of erosion control measures.

C. Pay any cost of fines or penalties levied from South Carolina Department of Health and Environmental Control for erosion control violations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Diversion: Use soil available at site, apply seed, lime, and fertilizer.

B. Fabric Drop Inlet Protection:
1. Wire Fabric. The wire fabric shall be at least a 19-gauge hardware cloth with a ¼ inch mesh opening. The total height shall be a minimum of 2 feet.
2. Steel posts to have 1.25 lb. /linear feet steel with a minimum length of 5 feet; maximum spacing is 4 feet.

C. Temporary Sediment Trap: Stone with d50 of 9 inches and a maximum size of 14 inches.

D. Sediment Fence (Silt Fence):
3. Using a synthetic filter fabric or a pervious sheet of at least 85% by weight of polyfins or polyester, which is certified by the manufacturer or supplier as conforming to the requirements in ASTM D 6461. Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 to 120 degrees F.
4. Ensure that posts for sediment fences are 1.25 lb/linear ft. steel with a minimum length of 4 ft. Make sure that steel posts have projections to facilitate fastening the fabric.
5. For reinforcement of standard strength filter fabric, use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

E. Rock Ditch Check: 12-inch, d50 Riprap and 1-inch, d50 washed stone.

F. Geotextile fabric for erosion control under riprap, SCDOT 804.2.11 CLASS 2; TYPE C with the following properties:

- Grab Strength-200 lbs.
- Seam Strength-180 lbs.
- Puncture Strength-80 lbs.
- Burst Strength-250 psi.
- Trapezoid Tear Strength- 80 lbs.
- Elongation @ Failure-15% minimum
- Ultraviolet Degradation @ 500 hrs.-50% Strength retained.
- Permittivity less than 0.1 per sec.

G. Seeding: See Section 32 92 00.

H. Rock Sediment Dike: d50 9-inch and No. 5 washed stone.

I. Sediment Tube: Excelsior wood, 18-inches in diameter and 10-feet long with outer netting. Outer netting to be seamless, high density polyethylene photodegradable materials treated with ultraviolet stabilizers.

PART 3 - EXECUTION

2.2 PREPARATION

A. Prior to General Stripping Topsoil and Excavating:
   1. Install perimeter dikes and swales.
   2. Excavate and shape sediment basins and traps.
   3. Construct pipe spillways and install stone filter where required.
   4. Machine compact all berms, dikes and embankments for basins and traps.

B. Construct sediment traps where indicated on Drawings during rough grading as grading progresses.

C. Temporarily seed basin slopes and topsoil stockpiles:
   1. Rate: 1/2 LB/1000 SF.
   2. Reseed as required until good stand of grass is achieved.
   3. Establish temporary vegetation of critical areas immediately after any land disturbing activity.

D. Ditch Lines: Re-stabilize all disturbed or relocated ditch lines by installing a temporary ditch liner of jute or geotextile fabric on the ditch bottom and side slopes.

2.3 INSTALLATION

A. Temporary Diversions:
   1. Remove and dispose of vegetation or other objectionable material.
   2. Excavate parabolic, trapezoidal, or V-shaped channel with a side slope of 2:1 or flatter, 3:1 where vehicles cross.
   3. A permanent vegetative cover is required for diversion channels with grades between 0.2 and 3%.
   4. Ensure that the minimum cross-section meets all design requirements and that the top of the dike is not lower at any point than the design elevation plus the specified settlement.
   5. Provide sufficient room around diversions to permit regrading and clean-out.
   6. Vegetate the ridge immediately after construction, unless it will remain in place less than 30 working days.

B. Fabric Drop Inlet Protection (Temporary):
   1. Space stakes evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely drive them into the ground, approximately 18 inches deep. They should be driven close to the drop inlet so that overflow will fall directly into the structure.
   2. Fasten fabric securely to the stakes and frames. Joints must be overlapped to the next stake. The bottom 12 inches of the fabric should be entrenched with at least 4 inches of crushed stone or 12 inches of compacted soil as backfill.
   3. Ensure that both fabric and supporting stakes are sufficiently strong to hold a 1.5 ft. head of water without failures.
   4. The top of the frames and fabric must be well below the ground elevation downslopes from the drop inlet to keep runoff from bypassing the inlet.
   5. It may be necessary to build a temporary site on the down slope side of the structures to prevent bypass flow. Improved performance and sediment storage volume can be obtained by excavating the area.

C. Temporary Sediment Trap:
   1. Clean, grub and strip the area under the embankment of all vegetation and root mat before construction begins. Remove all surface soil containing high amounts of organic matter.
   2. Ensure that fill material for the embankment is free of roots, woody vegetation, organic matter, and objectionable material. Place the fill in lifts not to exceed 9 inches and machine compact it. Over fill the embankment 6 inches to allow for settlement.
   3. Construct the outlet section in the embankment. Protect the connection between the riprap and the soil from piping by using filter fabric or a keyway cutoff trench between the riprap structure and the soil.

a. Place the filter fabric between the riprap and soil. Extend the fabric across the spillway foundation and sides to the top of the dam; or
a. Excavate a keyway trench along the centerline of the spillway foundation extending up the sides to the height of the dam. The trench should be at least 2 ft. deep and 2 ft. wide with 1:1 side slopes.

4. Clear the pond area below the elevation of the crest of the spillway to facilitate sediment cleanout.
5. All cut and fill slopes should be 2:1 or flatter.
6. Ensure that the stone (drainage) section of the embankment has a minimum bottom width of 3 ft. and maximum side slopes of 1:1 that extend to the bottom of the spillway section.
7. Construct the minimum finished stone spillway bottom width with 2:1 side slopes extending to the top of the overfilled embankment. Keep the thickness of the sides of the spillway outlet structure at a minimum of 21 inches. The weir must be level and constructed to grade to assure design capacity.
8. Material used in the stone section should be a well-graded mixture of stone with a d50 size of 9 inches (class B erosion control stone is recommended) and a maximum stone size of 14 inches. The stone may be machine placed and the smaller stones worked into the voids of the larger stones. The stone should be hard, angular, and highly weather-resistant.
9. Ensure that the stone spillway outlet section extends downstream past the toe of the embankment until stable conditions are reached and outlet velocity is acceptable for the receiving stream. Keep the edges of the stone outlet section flush with the surrounding ground and shape the center to confine the outflow stream (References: Outlet Protection).
10. Direct emergency bypass to natural, stable areas. Locate bypass outlets so that flow will not damage the embankment.
11. Stabilize the embankment and all disturbed areas above the sediment pool and downstream from the trap immediately after construction (References: Surface Stabilization).
12. Ensure that the spillway crest is level and 1.5 feet below the top of the dam at all points.
13. Remove sediment and restore capacity to original trap dimensions when sediment has accumulated to ½ design depth.

D. Sediment Fence (Silt Fence):
1. Construct the sediment barrier of the specified synthetic filter fabrics.
2. Ensure that the height of the sediment fence does not exceed 18 inches above the ground surface. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)
3. Construct the filter fabric from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with overlap to the next post.
4. Support standard strength filter fabric by wire mesh fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch long, or the wires. Extend the wire mesh support to the bottom of the trench.
5. When a wire mesh support fence is used, space posts a maximum of 8 ft. apart. Support posts should be driven securely into the ground to a minimum of 18 inches.
6. Extra strength filter fabric with 6-foot post spacing does not require wire mesh support fence. Staple or wire the filter fabric directly to posts.
7. Excavate a trench approximately 4 inches wide and 8 inches deep along the proposed line of posts and upslope from the barrier.
8. Backfill the trench with compacted soil or gravel placed over the filter fabric.
9. Do not attach filter fabric to existing trees.

E. Rock Ditch Check:
1. Place stone to the lines and dimensions shown in the plan on a filter fabric foundation.
2. Keep the center stone section at least 9 inches below natural ground level where the dam abuts the channel banks.
3. Extend stone at least 1.5 feet beyond the ditch banks to keep overflow water from undercutting the dam as it re-enters the channel

4. Set spacing between dams to assure that the elevation at the top of the lower dam is the same as the toe elevation of the upper dam.
5. Protect the channel downstream from the lowest check dam, considering that water will flow over and around the dam.
6. Make sure that the channel reach above the most upstream dam is stable.
7. Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced stones.

F. Seeding: See Section 32 92 00.

G. Rock Sediment Dike:
1. Clear the pipe inlet area of all vegetation, roots, and other objectionable material.
2. Install d50 12-inch stone in semi-circle around pipe inlet. Build the stone slightly higher where it ties into the embankment. The minimum height should be two (2) feet. The maximum height should be one (1) foot lower than the embankment.
3. Place a one (1) foot thick layer of No. 5 stone around the outside of the d50 12-inch stone.
4. Excavate 18" below grade around the outside of the stone semi-circle.
5. When contributing drainage area has been stabilized, fill in excavated area to final grade, compact properly, and stabilize with seeding.

H. Sediment Tubes:
1. Stake tubes with wooden stakes (2-in x 2-in) or steel posts ("U" or "T" sections with a minimum weight of 1.25 lb/lf), a minimum of four (4) feet in length, placed on 2-ft centers.
2. Install such that a gap does not exist between soil and tube.
3. Do not stack tubes on top of each other unless recommended by manufacturer.
4. Install tube in a trench with a depth of 1/5 the diameter of the tube.
5. Tubes should continue up side slopes a minimum of 1-foot above channel design flow depth.
6. Install stakes at a diagonal facing incoming flow.

I. Project Progress
1. Owner will limit the area of excavation commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such pollution control measures current in accordance with an accepted schedule. Should seasonal limitations make such coordination unrealistic, special erosion control measures shall be taken immediately to the extent feasible and justified.

2.4 MAINTENANCE

A. Temporary Diversions:
1. Inspect weekly and, after every rainfall, remove sediment from the flow area and repair the diversion ridges. Also check and maintain outlets.
2. When the protected area is permanently stabilized, remove the ridges and the channel to blend with the natural ground level and appropriately stabilize it.

B. Fabric Drop Inlet Protection (Temporary):
1. Inspect the fabric barrier weekly and after each rain and make repairs as needed.
2. Remove sediment from the pool area as necessary to provide adequate storage area for the next rain.
3. When the contributing drainage area has been adequately stabilized, remove all materials and any unstable sediment and dispose of them properly. Bring the disturbed area to the grades of the drop inlet and smooth and compact it. Appropriately stabilize all bare areas around the inlet.

C. Temporary Sediment Trap:
1. Inspect temporary sediment traps weekly and after each period of significant rainfall. Remove sediment and restore the trap to its original dimensions when the sediment has accumulated to one-half the design depth of the trap. Place the sediment that is removed in the designated disposal area and replace the contaminated part of the gravel facing.

2. Check the structure for damage from erosion or piping. Periodically check the depth of the spillway to ensure it is a minimum of 1.5 feet below the low point of the embankment. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately.
3. After all sediment-producing areas have been permanently stabilized, remove the structure and all unstable sediment. Smooth the area to blend with the adjoining areas and stabilize properly.

D. Sediment Fence (Silt Fence):
1. Inspect sediment fences at least once a week and after each rainfall. Make any required repairs immediately.
2. Should the fabric of a sediment fence collapse, tear, decompose, or become ineffective, replace it promptly. Replace burlap every 60 days.
3. Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.
4. Stabilize sediment fence area after the contributing drainage area has been properly stabilized. Remove all fencing materials and unstable sediment deposits and bring the area to grade.

E. Rock Ditch Check:
1. Inspect rock ditch checks and channels for damage weekly and after each runoff event.
2. Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam. Correct all damage immediately. If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel.
3. Remove sediment accumulated behind the dams as needed to prevent damage to channel vegetation, allow the channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam. Add stones to dams as needed to maintain design height and cross section.
4. Remove all materials at the end of the Project once notified to do so by the Engineer.

F. Seeding. See Section 32 92 00.

G. Rock Sediment Dike:
1. Inspect stone arrangement weekly and after every rainfall event.
2. Maintain specified dimensions and remove sediment buildup when the sediment level is ½ the height of the rocks.
3. Check and repair any damage to structure.
4. Remove all materials at the end of the Project once notified to do so by the Engineer.

H. Sediment Tubes:
1. 1. Inspect weekly and after each ½-inch or greater rainfall event.
2. 2. Monitor sediment buildup at tube. Remove sediment when accumulation reaches 1/3 the height of the tubes.
3. 3. Removed sediment shall be placed in stock pile areas or spread thinly across disturbed area. Stabilize removed sediment.
4. 4. Remove tube when contributing drainage area has been permanently stabilized.

2.5 NEAR COMPLETION OF CONSTRUCTION

A. Eliminate basins, dikes, traps, etc.

B. Grade to finished or existing grades.

C. Fine grade all remaining earth areas, then seed and mulch.

END OF SECTION

SECTION 32 91 13
TOPSOILING AND FINISHED GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Topsoiling and finished grading.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 01 - General Requirements.
   3. Section 31 10 00 - Site Clearing.
   4. Section 31 25 00 - Soil Erosion and Sediment Control.
   5. Section 32 92 00 - Seeding, Sodding and Landscaping.

C. Location of Work: All areas within limits of grading and all areas outside limits of grading which are disturbed in the course of the work.

1.2 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00.

B. Project Data:
   1. Test reports for furnished topsoil.

1.3 PROJECT CONDITIONS

A. Verify amount of topsoil stockpiled and determine amount of additional topsoil, if necessary to complete work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
   1. Original surface soil typical of the area.
   2. Existing topsoil stockpiled under Section 31 10 00.
   3. Capable of supporting native plant growth.

2.2 TOLERANCES

A. Finish Grading Tolerance: 0.1 FT plus/minus from required elevations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Correct, adjust and/or repair rough graded areas.
   1. Cut off mounds and ridges.
   2. Fill gullies and depressions.
   3. Perform other necessary repairs.
   4. Bring all sub-grades to specified contours, even and properly compacted.

B. Loosen surface to depth of 2 IN, minimum.

C. Remove all stones and debris over 2 IN in any dimension.

3.2 ROUGH GRADE REVIEW

A. Reviewed by Engineer in Section 31 10 00, Site Clearing.

3.3 PLACING TOPSOIL

A. Do not place when subgrade is wet or frozen enough to cause clodding.

B. Spread to compacted depth of 4 IN for all disturbed earth areas.

C. If topsoil stockpiled is less than amount required for work, furnish additional topsoil at no cost to Owner.

D. Provide finished surface free of stones, sticks, or other material 1 IN or more in any dimension.

E. Provide finished surface smooth and true to required grades.

F. Restore stockpile area to condition of rest of finished work.

3.4 ACCEPTANCE

A. Upon completion of topsoiling, obtain Engineer's acceptance of grade and surface.

B. Make test holes where directed to verify proper placement and thickness of topsoil.

END OF SECTION

SECTION 32 92 00
SEEDING, SODDING, AND LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Seeding, sodding and landscape planting:
      a. Soil preparation.
      b. Seeding.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Bidding Requirements, Contract Forms, and General Conditions.
   2. Division 01 - General Requirements.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Society for Testing and Materials (ASTM):
      a. D997, Drop Test for Loaded Cylindrical Containers.
      b. D2028, Standard Specification for Cutback Asphalt.
   2. Standard Methods of the Association of Official Agricultural Chemists.
   3. United States Department of Agriculture, (USDA):
      a. Federal Seed Act.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 01 33 00.
   2. Product technical data including:
      a. Acknowledgement that products submitted meet requirements of standards referenced.
      b. Manufacturer's installation instructions.
      c. Signed copies of vendor's statement for seed mixture required, stating botanical and common name, place of origin, strain, percentage of purity, percentage of germination, and amount of Pure Live Seed (PLS) per bag.
      d. Type of herbicide to be used during first growing season to contain annual weeds and application rate.
   3. Certification:
      a. Certify each container of seed delivered will be labeled in accordance with Federal and State Seed Laws and equals or exceeds Specification requirements.
   4. Other documents:
      a. Copies of invoices for fertilizer used on Project showing grade furnished, along with certification of quality and warranty. If Engineer determines fertilizer requires sampling and testing to verify quality, testing will be done at Contractor's expense, in accordance with current methods of Association of Official Agricultural Chemists. Upon completion of Project, a final check of total quantities of fertilizer used will be made against total area seeded. If minimum rates of application have not been met, Contractor will be required to distribute additional quantities to make up minimum application specified.

1.4 SEQUENCING AND SCHEDULING

A. Contractor shall seed, fertilize, and mulch within 30-days of water main installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed Quality: Fresh, clean, new-crop seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under Federal Seed Act in effect on date of bidding. Provide seed of species, proportions, and minimum percentages of purity, germination and maximum percentage of weed seed as specified. Approval of all seed for use shall be based on the accumulative total of PLS specified for each phase of work.

B. Permanent Seed Mixture:

1. After the installation of the utility is complete, the area disturbed in a non-residential area shall be seeded as follows:

a. September 1st through April 30th:

50 lbs./acre	Tall Fescue
75 lbs./acre	Rye Grain

b. May 1st through August 31st:

25 lbs/acre	Common Bermuda Grass (Hulled, hull absent)
30 lbs/acre	Kobe Lespedeza (Hulled, hull absent)

2. Refer to SCDOT Standard Specification SC-M-810-2 (4/11) for fertilizer, mulching and seed bed preparation requirements.

C. Temporary Seed: A temporary grass cover shall be provided immediately after grading in all disturbed areas that will have permanent grass cover. Provide fresh, clean, new crop seed labeled in accord with U.S. Department of Agriculture Rules and Regulations under Federal Seed Act in effect on date of bidding. Provide seed of grass species or mixtures and seed rates suitable to season of year from the following:

September 1st through April 30th:	Per Acre
Rye (Grain)	110 lbs.

May 1st through August 31st:	Per Acre
German Millet	40 lbs.

All seed used shall have been tested not more than six (6) months prior to seeding. The specifications provided with each container shall state the percent purity, germination and number of noxious weed seed per pound.

D. Mulch:

1. For seeded areas: Clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, peanuts, or other locally available mulch material which does not contain an excessive quantity of matured seeds of noxious weeds or other species that will grow or be detrimental to seeding, or provide a menace to surrounding land. Do not use material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

E. Fertilizer: Commercial fertilizer meeting applicable requirements of State and Federal law. Cyanic compound or hydrated lime not permitted in mixed fertilizers.

1. For seeding and sod: 5-10-5 analysis.

F. Limestone: Agricultural grade ground limestone containing not less than 88 percent of combined calcium and magnesium carbonates, 100 percent passing a 10-mesh sieve, 90 percent passing a 20-mesh sieve, and 60 percent passing a 100-mesh sieve.

G. Asphalt Binder: Emulsified asphalt per State specifications.

H. Water: Water free from substances harmful to grass or sod growth. Provide water from source approved prior to use.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. General:
   1. Limit preparation to areas which will be planted soon after.
   2. Provide facilities to protect and safeguard all persons on or about premises.
   3. Protect existing trees designated to remain.
   4. Verify location and existence of all underground utilities. Take necessary precaution to protect existing utilities from damage due to construction activity. Repair all damages to utility items at sole expense.
   5. Provide facilities such as protective fences and/or watchmen to protect work from vandalism. Contractor will be responsible for vandalism until acceptance of work in whole or in part.

B. Preparation for Lawn-Type Seeding, Sprigging, Plugging or Sodding:
   1. Loosen surface to minimum depth of 4 IN. Remove stones over 1 IN in any dimension and sticks, roots, rubbish, and other extraneous matter.
   2. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable device if the soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
   3. Distribute fertilizer uniformly over areas to be seeded:
      a. For seeding: 30 LBS per 1000 SF.
   4. Incorporate fertilizer into soil to a depth of at least 2 IN by disking, harrowing, or other approved methods. Remove stones or other substances from surface which will interfere with turf development or subsequent mowing operations.
   5. Grade lawn areas to a smooth and even surface with a loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted soon after preparation.
   6. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

3.2 INSTALLATION

A. Lawn-Type and Pasture Seeding:
   1. Do not use seed which is wet, moldy, or otherwise damaged.
   2. Perform seeding work from May 1 to August 31 for summer planting, and August 31 to April 30 for winter planting, unless otherwise approved by Engineer.
   3. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, or mechanical hand seeders, or other approved equipment.
   4. Distribute seed evenly over entire area at rate of application not less than 4 LBS (PLS) of seed per 1000 SF, 50 percent sown in one direction, remainder at right angles to first sowing.
   5. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds excessive moisture, or other factors. Resume work only when favorable conditions develop.
   6. Lightly rake seed into soil followed by light rolling or cultipacking.
   7. Immediately protect seeded areas against erosion by mulching. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.
   8. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer. Protect seeded areas against traffic or other use by erecting barricades and placing warning signs.

9. Immediately following spreading mulch, anchor mulch using a rolling coulter or a wheatland land packer having wheels with V-shaped edges to force mulch into soil surface, or apply evenly distributed emulsified asphalt at rate of 10-13 GAL/1000 SF. SS-1 emulsion in accordance with ASTM D997 or RC-1 cutback asphalt in accordance with ASTM D2028 are acceptable. If mulch and asphalt are applied in one treatment, use SS-1 emulsion with penetration test range between 150-200. Use appropriate shields to protect adjacent site improvements.

B. Temporary Seeding:
   1. Do not use seed which is wet, moldy, or otherwise damaged. Select species suitable to season of the year specified in this section.
   2. Employ satisfactory methods of sowing using mechanical power driven drills or seeders, or mechanical hand seeders, or other approved equipment. Cover seed from ¼-IN for rye grass to 1-IN for small grain. Firm the soil after planting with a culti-packer or suitable equipment.
   3. Immediately protect seeded areas of unscarified areas or cut slopes against erosion by mulching. Spread mulch in a continuous blanket using 1-1/2 tons per acre to a depth of 4 to 5 straws.
   4. Provide temporary erosion control of all bare, denuded or disturbed areas during seasons not suitable for growing on erosion-resistant cover by mulching the same as for seeded areas.
   5. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer.
   6. Apply water at a rate that will not cause runoff and erosion. Thoroughly wet the soil to a depth that will ensure germination of the seed. A second application should be made when needed.

3.3 MAINTENANCE AND REPLACEMENT

A. General:
   1. Begin maintenance of planted areas immediately after each portion is planted and continue until final acceptance or for a specific time period as stated below, whichever is the longer.
   2. Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep planted areas uniformly moist as required for proper growth.
   3. Protection of new materials:
      a. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain. Repair and pay for all damaged items.
   4. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

B. Seeded Lawns:
   1. Maintain seeded lawns: 90 days, minimum, after installation and review of entire project area to be planted.
   2. Maintenance period begins at completion of planting or installation of entire area to be seeded.
   3. Engineer will review seeded lawn area after installation for initial acceptance.
   4. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, uniform lawn, free of weeds and eroded or bare areas.
   5. Lay out temporary lawn watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch.
   6. Mow lawns as soon as there is enough top growth to cut with mower set at recommended height for principal species planted. Repeat mowing as required to maintain height. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 IN. Do not mow lower than 1-1/2 IN.

7. Re-mulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
8. Unacceptable plantings are those areas that do not meet the quality of the specified material, produce the specified results, or were not installed to the specified methods.
9. Replant bare areas using same materials specified.
10. Engineer will review final acceptability of installed areas at end of maintenance period.
11. Maintain repaired areas until remainder of maintenance period or approved by Engineer, whichever is the longer period.

END OF SECTION

SECTION 33 16 00
FRP WATER STORAGE TANKS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Underground Water Tanks:
   1. Tank installations in the following locations:
      a. United States.
   2. For the following applications:
      a. FRP Water Storage Tanks.

1.2 RELATED SECTIONS

A. Section 31 23 33 Tank Backfilling, and Compacting for Utilities

B. Section 03 09 00 - Concrete.

1.3 REFERENCES

A. Underground FRP Water Storage Tanks in the United States:
   1. American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.
   2. ANSI, AWWA D-120 and M-45 - Thermosetting Fiberglass-Reinforced Plastic Tanks.
   3. ASTM, D-4201 specification pertaining to fabrication and quality assurance testing of direct bury vessels.
   4. Tank manufacturer shall be recognized by Underwriters Laboratories as a manufacturer of tanks listed to the UL-1316 standard.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 – Submittal Requirements.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation manual and operating guidelines.

C. Shop Drawings: FRP Water Storage Tank manufacturer shall submit the following for review and approval prior to fabrication of the tanks:
   1. Detailed shop drawings of each tank complete with all accessories supplied by the manufacturer.
   2. Detailed shipping, handling and Installation Instructions and or Manual.

1.5 QUALITY ASSURANCE

A. Tank installations in the United States:
   1. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the FRP Water Storage Tank manufacturer's Installation and Operating Guidelines recommendations for delivery, storage, and tank handling.

1.7 WARRANTY

A. Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Tank installations in the United States: Acceptable Manufacturers:
   1. Xerxes Corporation, which is located at: 7901 Xerxes Ave. S.; Minneapolis, MN 55431; Tel: 952-887-1890; Fax: 952-887-1882.
   2. Darco Inc. Underground Tankage, which is located at: 980 Darco Drive; Bennette, Colorado 80102; Tel: 800-232-8660 ext. 8; Fax 303-644-5001.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 25 13 – Product Substitution Requirements.

2.2 UNDERGROUND FRP WATER STORAGE TANKS

A. Tank Design - Fiberglass reinforced plastic (FRP) tanks:(10 Tanks)
   1. The tank size: Nominal Capacity : 40,000 Gallons; Diameter 10 feet; Height 10 feet; Approximate Length 69'-2" fittings and accessories shall be as shown on the drawings.
   2. Tank shall be manufactured with structural ribs which are fabricated as in integral part of the tank wall.
   3. Tank shall be manufactured with a laminate consisting of resin and glass fiber reinforcement only. No sand/silica fillers or resin extenders shall be used.
   4. Tank shall be vented to atmospheric pressure.
   5. Tank shall be capable of handling liquids with specific gravity up to 1.1
   6. Tank shall be compatible with liquids identified in the manufacturer's standard limited warranty.
   7. Exposed Metals: Stainless Steel ANSI Type 316
   8. Heavy Duty Lifting Lugs , (6 typical each tank): Stainless Steel Type 304

B. Loading Conditions - Tank shall meet the following design criteria:
   1. Internal Load - Tank shall be designed to withstand a 5-psig (35 kPa) air-pressure test with a 5:1 safety factor.
   2. Surface Loads - Tank shall be designed to withstand surface H-20 and HS-20 axle loads when properly installed according to manufacturer's current Installation Manual and Operating Guidelines.
   3. External Hydrostatic Pressure - Tank shall be designed for 7 feet (2.1 m) of overburden over the top of the tank, the hole fully flooded, and a safety factor of 5:1 against general buckling.

C. Water Storage Applications:
   1. Governing Standards, as applicable:
      a. ANSI/AWWA D120 - Thermosetting Fiberglass-Reinforced Plastic Tanks.
      b. American Concrete Institute (ACI) standard ACI 318, Building Code Requirements for Structural Concrete.
      c. Tank manufacturer shall be recognized by Underwriters Laboratories (UL) as a manufacturer of tanks listed to the UL-1316 standard.
      d. NFPA 22 Standard for Water Tanks for Private Fire Protection.
   2. Tank Design: Single-Wall vessel as specified and shown on the Drawings.

3. Tank Accessories - FRP Water Storage Tank Applications:
   a. Tank Anchoring:
      1) Anchor straps shall be as supplied by tank manufacturer and designed for a maximum load of 25,000 lbs (11340 kg).
      2) Galvanized turnbuckles shall be supplied by the tank manufacturer.
      3) Prefabricated concrete anchors shall be supplied by the tank manufacturer, designed to the ACI 318 standard, manufactured with 4,000 psi concrete and shall have adjustable anchor points.
   b. Manway Openings:
      1) Potable water tank shall have at least one manway opening.
      2) The standard manway shall be flanged, 30 inches (559 mm) I.D. and 36 inch high riser complete with gaskets, bolts and cover supplied by the Manufacturer.
      3) Manway openings shall be designed to withstand 5-psig (35 kPa) test pressure with a 5:1 safety factor.
      4) Manway extensions shall be FRP and shall be supplied by tank manufacturer.
   c. Piping and Fittings(Each Tank)
      1) Tank shall be equipped with internal factory-installed piping that meets NSF/ANSI Standard 61.
      2) All flanged nozzles shall be flanged and flat-faced, and conform to Class 150 bolting patterns as specified in ANSI/ASME/ B16.5.
      3) Carbon steel and stainless steel NPT fittings shall withstand a minimum of 150 foot-pounds (203 NM) of torque and 1,000 foot-pounds (1356 NM) of bending, both with a 2:1 safety factor.
      4) Dry Hydrant suction assembly with 6" NST-F head
      5) 2- half coupling, NPT-F thread 4"
      6) 1-half coupling , NPT-F thread '6" –for venting
      7) 1-NFPA anti vortex plate @ bottom of suction line -6"
      8) 1- Screen guard for 6" vent pipe & head.
      9) 1-Siamese refill with 2-2.5" NST-FS
   d. Suction/Fill Tubes:
      1) Suction/fill tubes shall be 6" NST – F head manufactured with materials listed under NSF/ANSI Standard 61 and factory installed.
      2) Suction/fill tubes shall terminate 4 inches (102 mm) above the bottom of the tank.
   e. Post-Installation Safety Devices
      1) Provide and install 4" hollow core guide posts (yellow) with 3/8" diameter threaded hole at top for securing safety chain. Posts shall be a minimum of 88" in length and buried to a minimum depth of 36".
      2) 1-Eye Bolt, 3/8" - 16 UNC with a ring ID not less than 1-1/8".
      3) 5/16" dia. Safety chain (yellow) with 7/16" ID and 2" links.

PART 3 EXECUTION

3.1 TESTING

A. Tank shall be tested according to the tank manufacturer's Installation Manual and Operating Guidelines in effect at time of installation.

3.2 INSTALLATION

A. Tank shall be installed according to the FRP Water Storage Tank manufacturer's Installation

Manual and Operating Guidelines in effect at time of installation.

END OF SECTION

Appendix A

Appendix B

ENCROACHMENT PERMIT
TEN WATER POINT LOCATIONS FOR CONSOLIDATED FIRE DISTRICT

Project Summary

Newberry County is installing 40,000 gallon underground water storage tanks at ten (10) sites throughout the County to improve fire service in rural areas. The tanks will provide water for fire protection and reduce emergency service response times. The majority of sites are located on Newberry County or Consolidated Fire District property with 4 sites located on private land and 1 site located on a church property.

One of the project sites will require the reconstruction or addition of a driveway from an SCDOT owned roadway to provide access for emergency vehicles to the water tanks. The remaining sites will utilize existing driveways for access to the water tanks.

Site #10 is located at 15804 US Hwy 176, TMS #442-1. The site currently has two access points to US Hwy 176, one serving as a residential driveway and the other as access to an undeveloped portion of the property. The proposed water tank location will utilize the second driveway in the undeveloped portion of the property. The existing alignment of the driveway requires modification to accommodate emergency vehicles. The driveway will be realigned to provide access perpendicular to the existing roadway. Asphalt paving is proposed within SCDOT Right-of-Way.

Paving and restriping of the affected areas will be included in the project in accordance with SCDOT Standards Specifications for Highway Construction, latest edition. Any affected drainage structures will be replaced with similar size materials. Sediment and erosion control measures are specified in the plans to control stormwater runoff from each site.

The purpose of this encroachment permit is to obtain SCDOT permission to perform the driveway improvements along Road S-667 and US Hwy 176 within the SCDOT Right-of-Way. It is anticipated that the construction of the driveways can be performed under flagging operation. Permission is also requested for the necessary temporary traffic control signs for construction of the driveway.

Based on the limited amount of land disturbance, a small project notification will be submitted to the SCDHEC EQC Office.

A Project location map for Site 10 is attached showing the location of the project. The following information is provided with this submittal:

Construction Plans – The construction plans, prepared by HDR, include the plan layout. A complete copy of the project specifications can be provided upon request.

Traffic Control – Construction of the project shall be conducted in accordance with Section 600 of the SCDOT Standard Drawings for any temporary lane closures required. All traffic control activities shall be performed in accordance with SCDOT specifications.

Erosion Control – A Small Project Notification will be submitted to SCDHEC prior to beginning the project.

Schedule

Newberry County will proceed with the construction of the project upon receipt of the encroachment permit and the completion of the construction bidding process. The construction schedule will be determined by the selected Contractor, however, Newberry County will provide a minimum 24 hour notice to the SCDOT prior to initiating construction within the SCDOT right-of-way.

Contact Information

The encroachment permit has been applied for on behalf of Newberry County. The contact information for the County is provided on the encroachment permit application. Please copy HDR on all correspondence on this permit. The contact information for HDR is provided below:

HDR
Attn: Tom Miller
1122 Lady Street Suite 1100
Columbia, SC 29201
Phone: 803-509-6617
Fax: 803-929-0334
e-mail: thomas.miller@hdrinc.com

The contractor will be required to provide emergency contact information for the project to the SCDOT prior to initiating construction within SCDOT right-of-way.

HDR | ICA

Application for Encroachment Permit

S.C. Department of Transportation
Form 637 (Rev 09/2015)

Contact Information

Applicant: NewberryCounty

Street: 540 Wilson Road

City: Newberry

State: SC **Zip Code:** 29108

Phone: (803)456-7766 **Fax:**

Email: tlong@newberrycounty.net

Contact: Tommy Long, Emergency Services Coordinator

Project Location

Primary County: Newberry

County	Road Name
Newberry	[illegible]

1. Type of Encroachment: DRIVEWAY - COMMERCIAL

Newberry County is installing underground water storage tanks for fire protection in rural areas on several properties around the County and is requesting this permit to reconstruct an existing driveway with SCDOT Right of Way for access to the tank. It is anticipated that the new driveway will be used 1-2 times per month for emergencies and routine maintenance. Regular residential or commercial use of the driveway is not expected(CONTINUED ON ADDENDUM)

2. Description of Location:

Newberry County proposes to reconstruct an existing driveway at 15804 U.S. Hwy 176. A project location map is attached.

(Attach sketch indicating roadway features such as: pavement width, shoulder width, sidewalk and curb and gutter location, significant drainage structure, north arrow, right of way width, and location of the proposed encroachment with respect to the roadway centerline and the nearest intersecting road on the State system.)

3. The undersigned applicant hereby requests the SCDOT to permit encroachment on the SCDOT right of way as described herein. It is expressly understood that the encroachment, if and when constructed, shall be installed in accordance with the sketch attached hereto and made a part hereof. The applicant agrees to comply with and be bound by the SCDOT's "A Policy for Accommodating Utilities on Highways Rights of way", "Standard Specifications for Highway Construction", the "General Provisions" and "Special Provisions", attached hereto or made a part hereof by reference, during the installation, operation and maintenance of said encroachment within the SCDOT's Right of Way. **DISCHARGES OF STORM WATER AND NON-STORM WATER:** Work within State Highway right-of-way shall be conducted in compliance with all applicable requirements of the National Pollutant Discharge Elimination System (NPDES) permit(s) issued to the Department of Transportation (Department), to govern the discharge of storm water and non-storm water from its properties. Work shall also be in compliance with all other applicable Federal, State and Local laws and regulations, and with the Department's Encroachment Permits Manual and encroachment permit. The encroachment permit will not be issued until the applicant has received an NPDES construction permit from SC Department of Health and Environmental Control.

   The applicant agrees to comply with all current SCDOT Standards Specifications for Highway Construction including all Supplemental Technical Specifications. The applicant hereby further agrees, and binds his/her/its heirs, personal representatives, successors, assigns, to assume any and all liability for accidents or injuries to persons, or damage to property, including the highway, that may be caused by the construction, maintenance, use, moving or removing of the physical appurtenances contemplated herein.

Applicant's Name: Tommy Long **Date:**
(Please print or type)

Applicant's Sig: SIGN HERE **Title:**

For Office Use Only

For Office Use Only

In accordance with your request and subject to all the provisions, terms, conditions, and restrictions stated in the application and the general and special provisions attached hereto, the SCDOT hereby approves your application for an encroachment permit. This permit shall become null and void unless the work contemplated herein shall have been completed prior to:

✓ See Attached Special Provision and/or Permit Requirements

	NPDES Permit Nbr:	N/A
(Date received by res. Maint. Engr.)	(SCDOT Approval)	07/30/2019 (Date)

Application for Encroachment Permit
General Provisions

1. **DEFINITIONS: The word "Permittee" used herein shall mean the name of the person, firm, or corporation to whom this permit is addressed, his, her, its, heirs, personal representatives, successors and assigns. The word "DEPARTMENT" shall mean the South Carolina Department of Transportation.**
2. **NOTICE PRIOR TO STARTING WORK: Before starting the work contemplated herein within the limits of the highway right of way, the Department's Resident Maintenance Engineer in the county in which the proposed work is located shall be notified 24 hours in advance so that he may be present while the work is under way.**
3. **PERMIT SUBJECT TO INSPECTION: This permit shall be kept at the site of the work at all times while said work is under way and must be shown to any representative of the Department or law enforcement officer on demand.**
4. **PROTECTION OF HIGHWAY TRAFFIC: The applicant shall be responsible for the protection of the highway traffic at all times during the construction, maintenance, removing or moving of the encroachment permitted herein. Detours, barricades, warning signs and flagmen, as necessary,**
   shall be provided by and at the expense of the Permittee and shall be in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD). The work shall be planned and carried out so that there will be the least possible inconvenience to the motoring public. The Permittee agrees to observe all rules and regulations of the Department while carrying on the work contemplated herein and take all other precautions that circumstances warrant.
5. **STANDARDS OF CONSTRUCTION: All work shall conform to the Department's standards of construction and shall be performed in a workman-like manner. The applicant shall make adequate provisions for maintaining the proper drainage of the highway as it may be affected by the encroachment permitted herein. All work shall be subject to the supervision and satisfaction of the Department.**
6. **FUTURE MOVING OF PHYSICAL APPURTENANCES: If, in the opinion of the State Highway Engineer, it should ever become necessary to move or remove the physical appurtenances, or any part thereof contemplated herein, on account of change in location of the highway, widening of the highway, or for any other sufficient reason, such moving shall be done on demand of the Department at the expense of the Permittee.**
7. **RESTORATION OF HIGHWAY FACILITIES UPON MOVING OR REMOVING OF PHYSICAL APPURTENANCES: If, and when, the physical appurtenances contemplated herein shall be moved or removed, either on the demand of the Department or at the option of the Permittee, the highway and facilities shall immediately be restored to their original condition at the expense of the Permittee.**
8. **COSTS: All work in connection with the construction, maintenance, moving or removing of the physical appurtenances contemplated herein shall be done by and at the expense of the Permittee.**
9. **ADDITIONAL PERMISSIONS:**
   (a) It is distinctly understood that this permit does not in any way grant or release any rights lawfully possessed by the abutting property owners. The Permittee shall secure any such rights, as necessary, from said abutting property owners.
   (b) The Permittee shall be responsible for obtaining all other approvals or permits necessary for installation of the encroachment from other government entities.

(c) There shall be no excavation of soil nearer than two feet to any public utility line or appurtenant facility except with the consent of the owner thereof, or except upon special permission of this Department after an opportunity to be heard is given the owner of such line or appurtenant facility.

10. ADDITIONAL WORK PERFORMANCE:

(a) All crossings over the highway shall be constructed in accordance with "Specifications for Overhead Crossings of Light and Power Transmission Lines and Telegraph Lines over each other and over Highway Rights of Way in South Carolina," as approved by the Public Service Commission of South Carolina and effective as of date of this permit.

(b) All tunneling, boring, or jacking shall be done in such a way as not to disturb the highway surfacing.

(c) No pavement shall be cut unless specifically authorized herein.

(d) No excavation shall be nearer than three feet to the edge of pavement unless specifically authorized herein.

(e) Underground facilities will be located at minimum depths as defined in the "Utility Accommodations Manual" for the transmittant, generally as follows: 4 feet minimum for hazardous or dangerous transmittant, 3 feet minimum for other lines. The Department may approve shallower depths if adequate protection is provided. Such approval must be obtained in writing.

(f) Service and other small diameter pipes shall be jacked, driven, or otherwise forced underneath the pavements on any surfaced road without disturbing the pavement. The section under the highway pavement and within a distance of three (3) feet on either side shall be continuous without joints.

11. ACCESS:

(a) Permittee is responsible for maintaining reasonable access to private driveways during construction.

(b) It is expressly provided that, with respect to any limited access highway, the Permittee shall not have or gain access from the main traveled way of the highway, or the on or off ramps to such facility, except upon approval by the Department.

12. DRIVEWAYS:

(a) The existing crown of the highway shall be continued to the outside shoulder line of the highway.

(b) If the driveway or approach is concrete pavement, the pavement shall be constructed at least 6 inches thick and with a minimum of class 2500 concrete. There shall be a bituminous expansion joint, not less than 3/4 inches in thickness, placed between the highway paving and the paving of the approach for the full width of the approach.

13. BEAUTIFICATION:

(a) All trees, plants, flowers, etc. shall be placed in accordance with the provisions specifically stipulated herein.

(b) All trees, plants, flowers, etc. shall be maintained by, and at the expense of, the Permittee and the provisions of this permit shall become null and void, if and when said Permittee ceases to maintain aid trees, plants, flowers, etc.

14. AS-BUILT PLANS:

(a) The applicant shall provide the Department with survey-quality as-built plans in accordance with the requirements set forth in the Department's "A Policy for Accommodating Utilities on Highway Rights of Way".

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
Encroachment Permit

Permit No : 226033
Permit Decision Date : 7/30/2019
Expiration Date : 7/30/2020

Type Permit :DRIVEWAY - COMMERCIAL

Location:

District	Work County	Type	Route	Aux	Begin MP	End MP
2	Newberry, SC	US	176	None	11.841	11.915

Contact Information

Applicant: NewberryCounty Phone:

Contact: Tommy Long, Emergency Services Coordinator

Address: 540 Wilson Road,

City: Newberry State: SC Zip: 29108

Comments

Newberry County proposes to reconstruct an existing driveway at 15804 U.S. Hwy 176. A project location map is attached.

Special Provisions:

0004 - SCDOT SHALL BE NOTIFIED WHEN WORK DEFINED IN THE PERMIT STARTS AS WELL AS WHEN THE WORK IS COMPLETED. REFERENCE SHALL BE MADE BY PERMIT NUMBER.

0202 - PAVEMENT DESIGN SHALL BE AS SHOWN ON ATTACHED DOCUMENTATION

0207 - PIPE USED IN THIS INSTALLATION SHALL BE IN ACCORDANCE WITH SCDOT SPECIFICATION SC-M-714 AND COMPLY WITH CURRENT SCDOT POLICY.

0209 - DISTURBED VEGETATION SHALL BE RESEEDED ACCORDING TO THE SPECIFICAION FOR HIGHWAY CONSTRUCTION.

0301 - THE DITCHES AND/OR SHOULDERS DISTURBED DURING THE INSTALLATION SHALL BE RE-ESTABLISHED TO PROPER GRADE, ORIGINAL CROSS SECTION, STABILIZED, AND ALL DRAIN PIPES CLEARED.

0302 - NO EXCAVATION SHALL BE LEFT OPEN ALONG HIGHWAY.

0303 - THE ENTIRE DISTURBED AREA SHALL BE TOP-SOILED USING 3" OF SELECTED MATERIAL AND RE-GRASSED TO SCDOT SPECIFICATIONS.

0304 - PAVEMENT MARKINGS ALTERED DURING THIS INSTALLATION SHALL BE RESTORED BY THE APPLICANT.

0306 - TRAFFIC CONTROL, LIGHTS, SIGNS AND FLAG MEN WILL BE FURNISHED BY APPLICANT AND WILL CONFORM TO PART VI OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

0310 - FIELD CHANGES, IF NECESSARY, MUST BE APPROVED IN WRITING BEFORE ACTUAL CONSTRUCTION OF PROPOSED CHANGES.

0311 - SEDIMENT AND EROSION CONTROL DEVICES SHALL BE USED TO MINIMIZE THE MOVEMENT OF SEDIMENT.

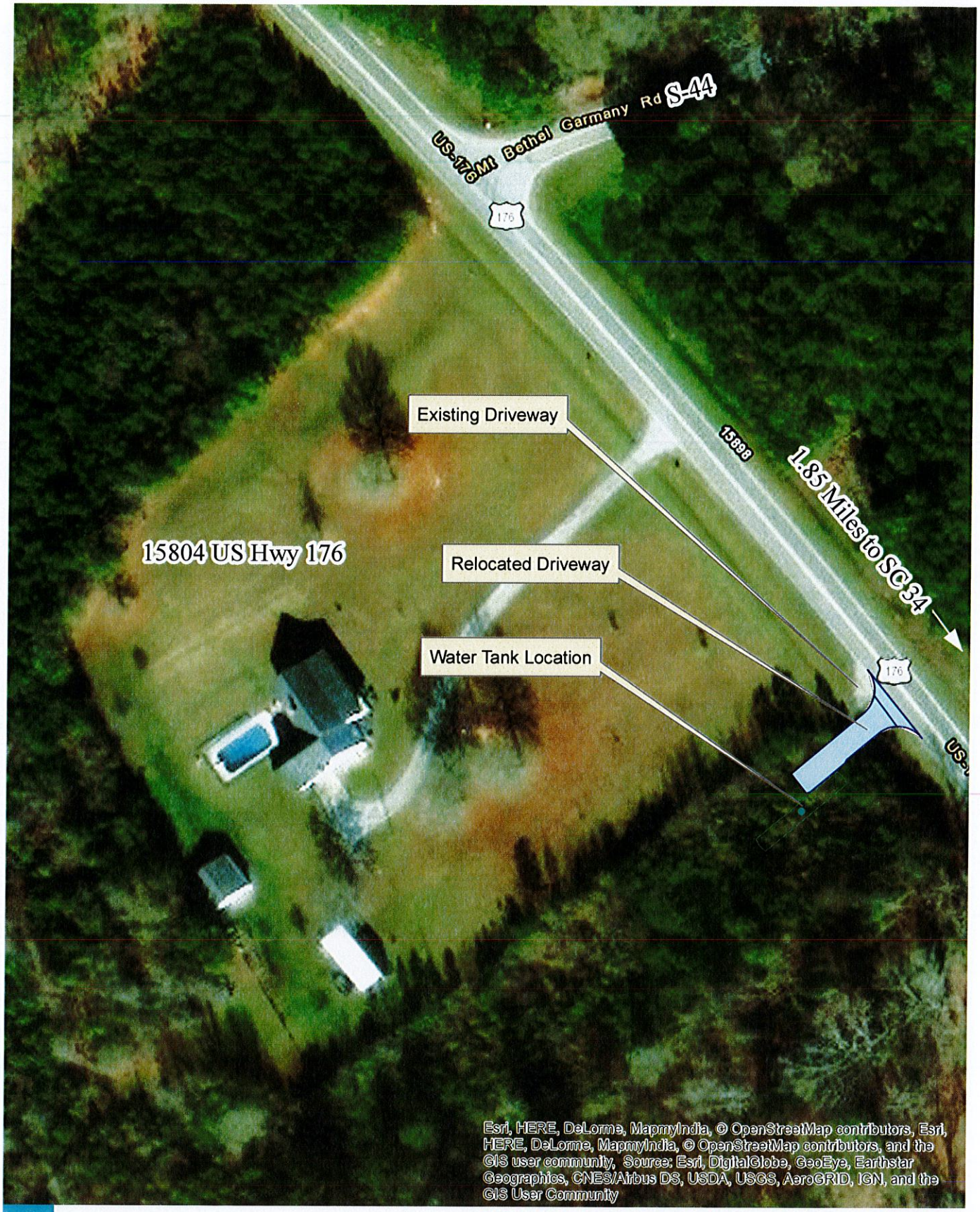
0312 - THE PERMITTEE SHALL HOLD THE DEPARTMENT HARMLESS FOR DAMAGES TO BOTH UPSTREAM AND DOWNSTREAM PROPERTIES.

0313 - TIMER TO BE SET FROM MIDNIGHT TO 5:00 A.M. ONLY. WINTER USE OF SPRINKLERS SHALL BE LIMITED TO TIMES WHEN THE TEMPERATURE IS FORTY (40) DEGREES AND RISING TO PREVENT THE POSSIBILITY OF ICE FORMING ON THE PAVEMENT.

0318 - THE APPLICANT SHALL BE RESPONSIBLE FOR IMMEDIATE REMOVAL OF SUCH TRAFFIC HAZARDS AS MUD, DEBRIS, LOOSE STONE, AND TRASH AS MAY BE WASHED OR SPILLED ON THE TRAVELED ROADWAY AS A RESULT OF THE PROPOSED WORK.

0320 - ALL DEBRIS TO BE CLEARED FROM THE RIGHTS-OF-WAY WITHIN TEN (10) DAYS.

0323 - SCDOT WILL NOT BE RESPONSIBLE FOR THE REPLACING OF THE SOD IF WE HAVE TO DO ANY WORK IN THE DITCH.



HDR

N

100

Feet

PROJECT LOCATION MAP - SITE 10 TMS#442-1

NEWBERRY COUNTY TEN WATER POINT TANKS
FOR THE CONSOLDIATED FIRE DISTRICT

PATH: L:\NEWBERRY COUNTY WATER TANKS\ARCGIS\ENCROACHMENT PERMIT - SITE 10.MXD - USER: TMILLER - DATE: 2/12/2018

REFERENCES

WORK ZONE TRAFFIC CONTROL ENGINEER

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER NO. 24242 WILLIE F. McCONNELL, JR

SIGNATURE

7/27/15
DATE

#	DATE	CHK	DESCRIPTION
6			
5			
4			
3			
2			
1			
0	1-14-15	JCS	NEW DRAWING

SCDOT

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

FLAGGING OPERATIONS
TWO-LANE TWO-WAY
PRIMARY &
SECONDARY ROUTES

610-005-00

EFFECTIVE LETTING DATE | JAN 2016

FLAGGING OPERATIONS
GENERAL NOTES

(ALL NOTES, SPECIFICATIONS AND REQUIREMENTS ON THIS STANDARD DRAWING APPLY TO ALL SUBSEQUENT STANDARD DRAWINGS REGARDING FLAGGING OPERATIONS UNLESS OTHERWISE NOTED)

FLAGGING OPERATIONS -

1. KEY FEATURES RELEVANT TO FLAGGING OPERATIONS:

   APPROACH TAPER - THIS IS A ONE-LANE TWO-WAY TAPER PLACED IN THE TRAVEL LANE WHERE THE WORK ACTIVITY TAKES PLACE. THIS TAPER PRECEDES THE BUFFER SPACE AND THE WORK ACTIVITY AREA. THE LENGTH OF THIS TAPER MAY VARY FROM 50 FEET TO 100 FEET. INSTALL AND MAINTAIN NO LESS THAN FIVE (5) TRAFFIC CONTROL DEVICES EQUALLY SPACED AT 10' TO 25' INTERVALS AS NECESSARY TO CORRESPOND WITH THE LENGTH OF THE TAPER.

   DOWNSTREAM TAPER - THIS TAPER, PLACED IN THE TRAVEL LANE WHERE THE WORK ACTIVITY TAKES PLACE, FOLLOWS THE WORK ACTIVITY AREA AND SERVES AS THE TERMINATION AREA FOR THE CLOSURE OF THE TRAVEL LANE. THE LENGTH OF THIS TAPER MAY VARY FROM 50 FEET TO 100 FEET. INSTALL AND MAINTAIN NO LESS THAN FIVE (5) TRAFFIC CONTROL DEVICES IN THIS TAPER.

   FLAGGER STATION - THIS IS THE SPECIFIC LOCATION OF THE FLAGGER.

   CLOSED LANE FLAGGER - THIS FLAGGER IS STATIONED ADJACENT TO THE FIRST TRAFFIC CONTROL DEVICE IN THE APPROACH TAPER WHO CONTROLS THE TRAFFIC THAT REQUIRES RELOCATION FROM THE TRAVEL LANE BEING CLOSED TO TRAFFIC.

   OPEN LANE FLAGGER - THIS FLAGGER IS STATIONED 100 FEET BEYOND THE LAST TRAFFIC CONTROL DEVICE IN THE DOWNSTREAM TAPER WHO CONTROLS THE TRAFFIC OPERATING IN THE TRAVEL LANE REMAINING OPEN TO TRAFFIC.

   BUFFER SPACE - THIS AREA IS LOCATED BETWEEN THE DOWNSTREAM END OF THE APPROACH TAPER AND THE NEAREST LIMITS OF THE WORK ACTIVITY AREA AND MAY PROVIDE SOME RECOVERY SPACE FOR AN ERRANT VEHICLE. THE PRESENCE OF PERSONNEL, TOOLS, MATERIALS, EQUIPMENT, WORK VEHICLES, ETC. WITHIN THE LIMITS OF THE BUFFER SPACE IS PROHIBITED. HOWEVER, WHEN THE MINIMUM DISTANCE REQUIREMENTS FOR THE BUFFER SPACE ARE UNAVAILABLE, A TRUCK MOUNTED ATTENUATOR MAY TEMPORARILY ENCROACH UPON THE BUFFER SPACE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE SECTION BELOW ENTITLED, "BUFFER SPACE", WHEN APPROVED BY THE ENGINEER.

   WORK ACTIVITY AREA - PERSONNEL, MATERIALS, EQUIPMENT, WORK VEHICLES, ETC. ARE PRESENT WITHIN THIS AREA TO CONDUCT THE WORK.

   LIMITS of the WORK ACTIVITY AREA - THIS IS THE BOUNDARY OF THE WORK ACTIVITY AREA FIRST ENCOUNTERED, FROM EITHER DIRECTION, BY MOTORISTS PASSING BY THE WORK ACTIVITY AREA IN THE ADJACENT TRAVEL LANE OPEN TO TRAFFIC AND CONTROLLED BY THE FLAGGERS.

   APPROACH LANE - TRAFFIC APPROACHES AN INTERSECTION OR A SPECIFIC LOCATION IN THIS TRAVEL LANE.

   DEPARTURE LANE - TRAFFIC DEPARTS FROM AN INTERSECTION OR A SPECIFIC LOCATION IN THIS TRAVEL LANE.

   MAINLINE APPROACH - THIS IS AN APPROACH TO THE WORK ACTIVITY AREA ON THE ROADWAY WHERE THE WORK ACTIVITY AREA IS LOCATED.

   SIDE ROADS - THESE ROADS INTERSECT THE ROADWAY ON WHICH THE WORK ACTIVITY AREA IS LOCATED.

   LIMITS of the INTERSECTION - THE LIMITS OF OR THE PHYSICAL AREA WITHIN AN INTERSECTION IS DEFINED BY THE LOCATION OF STOP BARS WHEN PRESENT, WHEN STOP BARS ARE ABSENT, THE LIMITS OF OR THE PHYSICAL AREA WITHIN AN INTERSECTION IS DEFINED BY THE LOCATION POINTS WHERE THE CORNER RADII BETWEEN ADJACENT ROADWAY APPROACHES TIE TO THE EDGE OF PAVEMENT OR THE EDGE OF TRAVEL LANE ADJACENT TO THE EDGE OF PAVEMENT OF EACH ROADWAY.

2. INSTALL, CONDUCT AND MAINTAIN FLAGGING OPERATIONS IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS, THE STANDARD DRAWINGS, THE MUTCD AND THE "SOUTH CAROLINA FLAGGER'S HANDBOOK" UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT. INSTALL ALL SIGNS RELATIVE TO A FLAGGING OPERATION PRIOR TO INITIATION OF THE OPERATION AND REMOVE OR COVER ALL SIGNS IMMEDIATELY UPON TERMINATION OF THE OPERATION. EQUIP EACH FLAGGER WITH A 24" x 24" STOP/SLOW PADDLE MOUNTED ON A RIGID HANDLE WITH A MINIMUM LENGTH OF 7 FEET. THE DEPARTMENT PROHIBITS THE USE OF FLAGS EXCEPT DURING EMERGENCY SITUATIONS.
3. LANE CLOSURES FOR FLAGGING OPERATIONS ARE RESTRICTED TO A MAXIMUM DISTANCE OF 2 MILES UNLESS OTHERWISE APPROVED BY THE ENGINEER. THE WORK LIMITS WILL COMPLY WITH THE CONTRACT AND SHALL REQUIRE THE ENGINEER'S APPROVAL PRIOR TO BEGINNING THE WORK.
4. INSTALL AND MAINTAIN THE PROPER ARRAY OF ADVANCE WARNING SIGNS FOR EACH "MAINLINE APPROACH" WHEN A FLAGGING OPERATION IS IN PLACE AND ACTIVE. WHEN NECESSARY TO RELOCATE THE "FLAGGER STATION" WHILE ACTIVELY MAINTAINING THE FLAGGING OPERATION, INSTALL AN ADDITIONAL ARRAY OF ADVANCE WARNING SIGNS AT THE LOCATION RELATIVE TO THE NEW "FLAGGER STATION" AND REMOVE THE ORIGINAL ARRAY OF ADVANCE WARNING SIGNS IMMEDIATELY UPON COMPLETION OF THE RELOCATION OF THE FLAGGER TO THE NEW "FLAGGER STATION".
5. INSTALL ALL ADVANCE WARNING SIGNS IMMEDIATELY PRIOR TO INITIATING A FLAGGING OPERATION AND REMOVE OR COVER ALL SIGNS IMMEDIATELY UPON TERMINATION OF THE OPERATION.
6. MAINTAIN TWO-WAY RADIO COMMUNICATIONS BETWEEN ALL FLAGGERS.

NIGHTTIME FLAGGING OPERATIONS -

1. EACH FLAGGER SHALL WEAR SAFETY APPAREL IN COMPLIANCE WITH THE REQUIREMENTS OF ANSI/ ISEA 107 STANDARD PERFORMANCE FOR CLASS 3 RISK EXPOSURE, LATEST REVISION, WHEN CONDUCTING NIGHTTIME FLAGGING OPERATIONS.
2. ILLUMINATE EACH "FLAGGER STATION" WITH ANY COMBINATION OF PORTABLE LIGHTS, STANDARD ELECTRIC LIGHTS, EXISTING STREET LIGHTS, ETC. THAT WILL PROVIDE A MINIMUM ILLUMINATION LEVEL OF 108 Lx OR 10 fc WHEN CONDUCTING NIGHTTIME FLAGGING OPERATIONS.
3. SUPPLEMENT EACH ARRAY OF ADVANCE WARNING SIGNS ON EACH "MAINLINE APPROACH" WITH A TRAILER MOUNTED CHANGEABLE MESSAGE SIGN. THESE CHANGEABLE MESSAGE SIGNS ARE NOT REQUIRED ON THE "SIDE ROADS" INTERSECTING THE ROADWAY WHERE THE "WORK ACTIVITY AREA" IS LOCATED. ALSO, THESE CHANGEABLE MESSAGE SIGNS ARE NOT REQUIRED DURING DAYTIME FLAGGING OPERATIONS UNLESS OTHERWISE DIRECTED BY THE STANDARD DRAWINGS. INSTALL THE CHANGEABLE MESSAGE SIGNS IN ADVANCE OF THE ADVANCE WARNING SIGN ARRAYS. THE MESSAGES SHOULD BE "PREPARE TO STOP", "FLAGGER AHEAD". A TRUCK MOUNTED CHANGEABLE MESSAGE SIGN IS NOT AN ACCEPTABLE ALTERNATIVE TO A TRAILER MOUNTED CHANGEABLE MESSAGE SIGN DURING NIGHTTIME FLAGGING OPERATIONS.
4. UTILIZE PORTABLE PLASTIC DRUMS OR 42" OVERSIZED TRAFFIC CONES IN PLACE OF 36" STANDARD TRAFFIC CONES DURING NIGHTTIME FLAGGING OPERATIONS.

BUFFER SPACE -

1. THE MINIMUM DISTANCE REQUIREMENTS FOR THE "BUFFER SPACE" ARE BASED UPON THE LEGAL POSTED REGULATORY SPEED LIMIT OF THE ROADWAY PRIOR TO BEGINNING THE WORK.

SPEED LIMIT	DISTANCES
LOW SPEED ≤ 35 MPH	200 FEET
INTERMEDIATE SPEED 40 - 50 MPH	300 FEET
HIGH SPEED 55 MPH	400 FEET

2. THE PRESENCE OF PERSONNEL, TOOLS, MATERIALS, EQUIPMENT, WORK VEHICLES, ETC. WITHIN THE LIMITS OF THE "BUFFER SPACE" IS PROHIBITED. A TRUCK MOUNTED ATTENUATOR IS THE ONLY WORK VEHICLE THAT MAY TEMPORARILY ENCROACH UPON THE "BUFFER SPACE" IN ACCORDANCE WITH THE CONDITIONS SPECIFIED IN THE FOLLOWING NOTE WHEN APPROVED BY THE ENGINEER. SEE NOTE NO. 3.
3. WHEN THE MINIMUM DISTANCE REQUIREMENTS FOR THE "BUFFER SPACE" ARE UNAVAILABLE DUE TO FIELD CONDITIONS, IT MAY BE NECESSARY FOR A TRUCK MOUNTED ATTENUATOR TO TEMPORARILY ENCROACH UPON THE "BUFFER SPACE" WHEN APPROVED BY THE ENGINEER. A TRUCK MOUNTED ATTENUATOR IS THE ONLY VEHICLE PERMITTED TO TEMPORARILY ENCROACH UPON THE "BUFFER SPACE" AND THIS ENCROACHMENT IS ONLY PERMITTED WHEN ALL REASONABLE OPTIONS TO AVOID DOING SO HAVE BEEN EXHAUSTED. WHEN ENCROACHMENT UPON THE "BUFFER SPACE" IS APPROVED BY THE ENGINEER, MINIMIZE THE TIME DURATION OF THE ENCROACHMENT BY REMOVAL OF THE TRUCK MOUNTED ATTENUATOR FROM THE "BUFFER SPACE" AT THE FIRST OPPORTUNITY THE MINIMUM DISTANCE REQUIREMENTS FOR THE "BUFFER SPACE" BECOME AVAILABLE.

SIGNS AND TRAFFIC CONTROL DEVICES -

1. MEASURE THE ADVANCE WARNING SIGN LOCATIONS FOR EACH APPROACH FROM THE "FLAGGER STATION" LOCATED ON THAT APPROACH.
2. INSTALL THE ADVANCE WARNING SIGNS AS SPACING INTERVALS BASED UPON THE POSTED REGULATORY SPEED LIMIT OF THE ROADWAY PRIOR TO BEGINNING ANY WORK. THE ADVANCE WARNING SIGN SPACING INTERVALS INDICATED ARE FOR NORMAL CONDITIONS. ADJUSTMENTS TO THESE DISTANCES MAY BE NECESSARY DUE TO EXISTING SIGNS, INTERSECTING ROADWAYS, HORIZONTAL AND/OR VERTICAL ALIGNMENTS OR OTHER SIGHT DISTANCE RESTRICTIONS. SEE TABLE A.
3. INSTALL ADVANCE WARNING SIGNS MOUNTED ON PORTABLE SIGN SUPPORTS NO LESS THAN 4 FEET FROM THE NEAR EDGE OF THE SIGN TO THE NEAR EDGE OF AN ADJACENT TRAVEL LANE ON ROADWAYS WITH EARTH SHOULDERS AND NO LESS THAN 6 FEET FROM THE NEAR EDGE OF THE SIGN TO THE NEAR EDGE OF AN ADJACENT TRAVEL LANE ON ROADWAYS WITH PAVED SHOULDERS. WHEN CURB & GUTTER IS PRESENT, INSTALL THE SIGN NO LESS THAN 2 FEET FROM THE NEAR EDGE OF THE SIGN TO THE FACE OF THE CURB.
4. ALL SIGNS MOUNTED ON PORTABLE SIGN SUPPORTS SHALL HAVE A MINIMUM MOUNTING HEIGHT OF 5 FEET FROM THE GROUND TO THE BOTTOM OF THE SIGN. ALL SIGNS MOUNTED ON GROUND MOUNTED U-CHANNEL OR SQUARE STEEL TUBE POSTS SHALL HAVE A MINIMUM MOUNTING HEIGHT OF 7 FEET FROM THE GRADE ELEVATION OF THE NEAR EDGE OF THE ADJACENT TRAVEL LANE TO THE BOTTOM OF THE SIGN UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT. MOUNT ALL SIGNS STRAIGHT AND LEVEL AND WITH THE FACE OF THE SIGNS PERPENDICULAR TO THE SURFACE OF THE ROADWAY.
5. REFLECTORIZE ORANGE ADVANCE WARNING SIGNS AND ANY ORANGE AREAS OF A MULTI-COLORED ADVANCE WARNING SIGN WITH A FLUORESCENT ORANGE COLORED PRISMATIC RETROREFLECTIVE SHEETING. REFLECTORIZE WHITE REGULATORY SIGNS AND ANY WHITE AREAS OF A MULTI-COLORED ADVANCE WARNING SIGN WITH A WHITE COLORED PRISMATIC RETROREFLECTIVE SHEETING.
6. ALL TRAFFIC CONTROL DEVICES SHALL COMPLY WITH THE REQUIREMENTS OF NCHRP REPORT 350 OR THE AASHTO MANUAL FOR ASSESSING SAFETY HARDWARE (MASH) AND SHALL REQUIRE APPROVAL BY THE DEPARTMENT. ONLY THOSE TRAFFIC CONTROL DEVICES INCLUDED ON THE "APPROVED PRODUCTS LIST FOR TRAFFIC CONTROL DEVICES IN WORK ZONES" ARE CONSIDERED ACCEPTABLE FOR USE. THIS LIST MAY BE ACCESSED ON THE DEPARTMENT'S WEB SITE AT: www.scdot.org .
7. REFLECTORIZATION OF 36" TRAFFIC CONES USED DURING DAYLIGHT HOURS IS NOT REQUIRED IN THE EVENT A DAYTIME FLAGGING OPERATION EXTENDS INTO THE NIGHTTIME HOURS, REPLACE ALL 36" TRAFFIC CONES WITH EITHER PORTABLE PLASTIC DRUMS OR 42" OVERSIZED TRAFFIC CONES. REFLECTORIZE ALL PORTABLE PLASTIC DRUMS AND 42" OVERSIZED TRAFFIC CONES WITH TYPE III OR GREATER FLEXIBLE MICROPRISMATIC RETROREFLECTIVE SHEETING UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT.
8. DELINEATE THE TANGENT AREA OF THE LANE CLOSURE WITH THE NECESSARY TRAFFIC CONTROL DEVICES TO MINIMIZE ENCROACHMENT BY MOTORISTS INTO THE CLOSED TRAVEL LANE UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ON ROADWAYS WITH POSTED REGULATORY SPEED LIMITS OF 35 MPH OR LESS, INSTALL THE TRAFFIC CONTROL DEVICES AT SPACING INTERVALS OF 25 FEET. ON ROADWAYS WITH POSTED REGULATORY SPEED LIMITS OF 40 MPH OR GREATER, INSTALL THE TRAFFIC CONTROL DEVICES AT SPACING INTERVALS OF 50 FEET. SEE TABLE B.

ADVANCE WARNING ARROW PANEL -

1. DURING FLAGGING OPERATIONS, AN ADVANCE WARNING ARROW PANEL SHALL OPERATE IN THE "FOUR CORNERS" CAUTION MODE WHEN LOCATED WITHIN OR IN BETWEEN THE LIMITS OF THE ADVANCE WARNING SIGN ARRAYS SPECIFIC TO A FLAGGING OPERATION. OPERATION OF AN ADVANCE WARNING ARROW PANEL IN AN ARROW, CHEVRON OR ANY OTHER TYPE OF CAUTION MODE OTHER THAN THE "FOUR CORNERS" CAUTION MODE WHEN LOCATED WITHIN OR IN BETWEEN THE LIMITS OF THE ADVANCE WARNING SIGN ARRAYS AS SPECIFIED HEREINBEFORE IS PROHIBITED.
2. ALL ADVANCE WARNING ARROW PANELS SHALL COMPLY WITH THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION. THE SPECIFIC LOCATION OF AN ADVANCE WARNING ARROW PANEL MAY REQUIRE ADJUSTMENTS DUE TO HORIZONTAL AND/OR VERTICAL ALIGNMENT OR OTHER SIGHT DISTANCE RESTRICTIONS.

TRUCK MOUNTED ATTENUATOR -

1. A TRUCK MOUNTED ATTENUATOR IS OPTIONAL. UTILIZATION OF A TRUCK MOUNTED ATTENUATOR SHOULD BE CONSIDERED WHEN THE MINIMUM DISTANCE REQUIREMENTS FOR THE "BUFFER SPACE" ARE UNAVAILABLE DUE TO FIELD CONDITIONS. HOWEVER, A TRAILER MOUNTED ADVANCE WARNING ARROW PANEL MAY BE UTILIZED IN PLACE OF A TRUCK MOUNTED ATTENUATOR DURING TRAFFIC CONTROL SETUPS FOR WORK ACTIVITIES SUCH AS ASPHALT CONCRETE PLACEMENT OPERATIONS WHEN APPROVED BY THE ENGINEER.
2. WHEN UTILIZING A TRUCK MOUNTED ATTENUATOR, ENSURE THE TRUCK HAS THE CORRECT GROSS VEHICULAR WEIGHT (GVW) REQUIRED FOR THE TYPE OF TRUCK MOUNTED ATTENUATOR BEING UTILIZED. A DIRECT TRUCK MOUNTED TRUCK MOUNTED ATTENUATOR, A UNIT MOUNTED AND ATTACHED TO BRACKETS OR SIMILAR DEVICES CONNECTED TO THE FRAME OF THE TRUCK, REQUIRES A TRUCK WITH A MINIMUM GVW OF 15,000 POUNDS (ACTUAL WEIGHT) UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT. A TRAILER TOWED TRUCK MOUNTED ATTENUATOR, A TRAILER TYPE UNIT TOWED FROM BEHIND AND ATTACHED TO THE FRAME OF THE TRUCK VIA A PINTLE HOOK / HITCH, REQUIRES A TRUCK WITH A MINIMUM GVW OF 10,000 POUNDS (ACTUAL WEIGHT) UNLESS OTHERWISE DIRECTED BY THE DEPARTMENT. IF THE ADDITION OF SUPPLEMENTAL WEIGHT TO THE VEHICLE AS BALLAST IS NECESSARY, CONTAIN THE MATERIAL WITHIN A STRUCTURE CONSTRUCTED OF STEEL. CONSTRUCT THIS STEEL STRUCTURE TO HAVE A MINIMUM OF FOUR (4) SIDES AND A BOTTOM. A TOP IS OPTIONAL. BOLT THIS STRUCTURE TO THE FRAME OF THE TRUCK. UTILIZE A SUFFICIENT NUMBER OF FASTENERS FOR ATTACHMENT OF THE STEEL STRUCTURE TO THE FRAME OF THE TRUCK TO ENSURE THE STRUCTURE WILL NOT SEPARATE FROM THE FRAME OF THE TRUCK DURING AN IMPACT UPON THE TRUCK MOUNTED ATTENUATOR. UTILIZE EITHER DRY LOOSE SAND OR STEEL REINFORCED CONCRETE FOR BALLAST MATERIAL WITHIN THE STEEL STRUCTURE TO ACHIEVE THE NECESSARY WEIGHT. THE BALLAST MATERIAL SHALL REMAIN CONTAINED WITHIN THE CONFINES OF THE STEEL STRUCTURE IN ITS ENTIRETY AND SHALL NOT PROTRUDE FROM THE STEEL STRUCTURE IN ANY MANNER.
3. LOCATE THE TRUCK MOUNTED ATTENUATOR APPROXIMATELY 100 FEET IN ADVANCE OF THE "WORK ACTIVITY AREA" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
4. PROVIDE, INSTALL AND MAINTAIN THE TRUCK MOUNTED ATTENUATOR AS SPECIFIED BY THE STANDARD SPECIFICATIONS AND AS DIRECTED BY THE ENGINEER.

GENERAL -

1. CONDUCT THE WORK IN SUCH A MANNER SO AS NOT TO ENCROACH ONTO THE ADJACENT TRAVEL LANE OPEN TO TRAFFIC. INSTALL, MAINTAIN AND ADJUST THE TRAFFIC CONTROL DEVICES AS NECESSARY TO ENSURE PROPER DELINEATION OF THE WORK AREA.
2. IF WORK IS BEING CONDUCTED AT TWO DIFFERENT LOCATIONS AT THE SAME TIME, SEPARATE THE TWO LOCATIONS BY NO LESS THAN 2 MILES FROM THE LAST TRAFFIC CONTROL DEVICE IN THE "DOWNSTREAM TAPER" OF THE FIRST LANE CLOSURE TO THE FIRST TRAFFIC CONTROL DEVICE IN THE "APPROACH TAPER" OF THE SECOND LANE CLOSURE ENCOUNTERED BY A MOTORIST UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
3. THE DEPARTMENT RESERVES THE RIGHT TO RESTRICT WORK OPERATIONS AND/OR WITHHOLD THE MONTHLY ESTIMATE IF THE TRAFFIC CONTROL IS NOT PROPERLY INSTALLED AND MAINTAINED AS DIRECTED BY THE STANDARD SPECIFICATIONS, THE SPECIAL PROVISIONS, THE STANDARD DRAWINGS, THE PLANS AND/OR THE ENGINEER.

TABLE A

SIGN PLACEMENT INTERVALS	
SPEED LIMIT	*
# ≤ 35 MPH LOW SPEED	200
# 40 - 50 MPH INTERMEDIATE SPEED	350
# 55 MPH HIGH SPEED	500

REGULATORY POSTED SPEED LIMIT PRIOR TO BEGINNING WORK

TABLE B

TRAFFIC CONTROL DEVICE SPACING INTERVALS WORK ACTIVITY / BUFFER SPACE AREAS	
SPEED LIMIT	SPACING INTERVALS
≤ 35 MPH	25 FEET
40 - 55 MPH	50 FEET

THIS DRAWING IS NOT TO SCALE

DRAWING 610-005-10 NOTES

1. SEE STANDARD DRAWING NO. 610-005-00 FOR ALL GENERAL NOTES AND REQUIREMENTS.

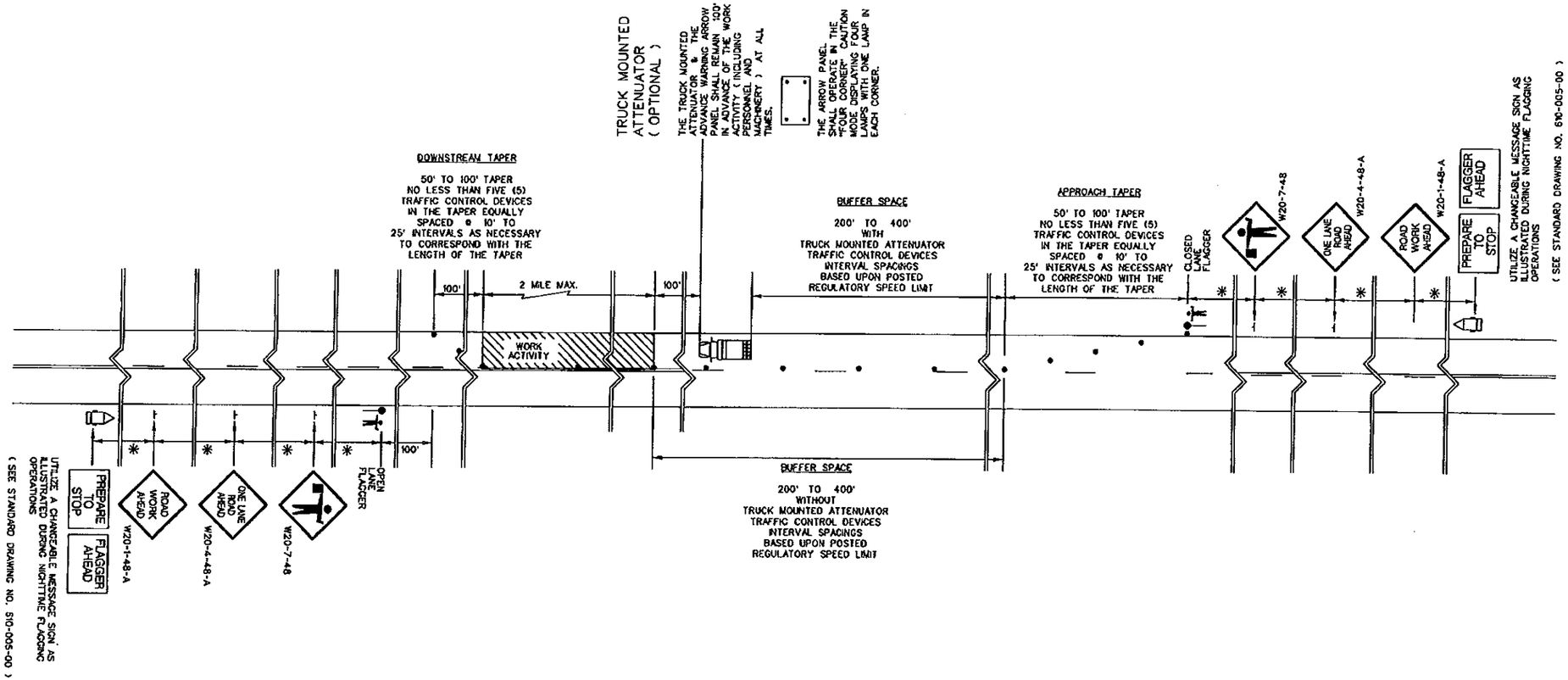


TABLE A

SIGN PLACEMENT INTERVALS	
SPEED LIMIT	*
# ≤ 35 MPH LOW SPEED	200
# 40 - 50 MPH INTERMEDIATE SPEED	350
# 55 MPH HIGH SPEED	500

REGULATORY POSTED SPEED LIMIT PRIOR TO BEGINNING WORK

TABLE B

TRAFFIC CONTROL DEVICE SPACING INTERVALS WORK ACTIVITY / BUFFER SPACE AREAS	
SPEED LIMIT	SPACING INTERVALS
≤ 35 MPH	25 FEET
40 - 55 MPH	50 FEET

THIS DRAWING IS NOT TO SCALE

REFERENCES

WORK ZONE TRAFFIC CONTROL ENGINEER

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
NO. 24242
WILLIE E. McCONNELL, JR

SIGNATURE

7/27/15
DATE

#	DATE	CHK	DESCRIPTION
6			
5			
4			
3			
2			
1			
0	1-15-15	JCS	NEW DRAWING

SCDOT
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION
DESIGN STANDARDS OFFICE
955 PARK STREET
ROOM 405
COLUMBIA, SC 29201

STANDARD DRAWING

FLAGGING OPERATIONS TWO-LANE TWO-WAY ROADWAYS WITHOUT INTERSECTIONS

610-005-10

EFFECTIVE LETTING DATE | JAN 2016

Subsurface Investigation and Foundation Design Report

Newberry County Capital Sales Tax Project No. 6 Ten Water Point Locations for the Consolidated Fire District

Newberry County, South Carolina

March 14, 2018

Executive Summary

HDR Engineering Inc., of the Carolinas, (HDR) understands that the County of Newberry (the County) is planning to install one (1) 40,000-gallon fiberglass reinforced plastic (FRP) underground fire suppression water storage tank, on ten different sites across the eastern, central, and northeastern portions of the county. HDR was contracted to design the foundations for these tanks.

It is our understanding that County wishes to install DARCO, Inc., brand tanks, or a commercially available equivalent FRP tank product. For the purposes of this design, we utilized design criteria and recommendations for DARCO, Inc. brand FRP tanks.

Our subsurface investigation consisted of a site reconnaissance, advancing one (1) 50-foot boring, collecting disturbed and undisturbed samples, and performing geotechnical laboratory determination of soil index and strength properties. Our foundation design consisted of bearing capacity and settlement analyses for each site and general construction related recommendations.

Sufficient bearing capacity to support tank installation was exhibited at each site. Anticipated bearing pressure for the foundation pads supporting the water storage tanks were calculated to be approximately 1.6-kips/ft^2. The existing in-situ vertical stress at the foundation level is approximately 1.8-kips/ft^2. The foundations will be embedded approximately 15-feet below the existing ground surface elevation and will consist of a graded aggregate pad. The foundations will be supported on medium dense to dense residual soils, either silty sand or silt underlain by weathered rock and rock. Given the nature of the foundation soils, and the fact that the total bearing stresses beneath the tank foundations will not exceed the existing vertical stresses, post-construction settlements are anticipated to be small, less than ¼ inch, at each of the proposed sites. The majority of the settlement is expected to occur during tank installation and within two weeks of the completion of construction at each site. Since the predominant foundation soil type is silt, negligible, if any, secondary settlement would be expected to occur.

We have included key portions of a manufacturer's installation recommendations relative to specific sections of this report for ease of reference. The complete manufacturer installation recommendations, as well as their installation manual may be downloaded from their website.

The results of our field investigation, laboratory testing and analyses, as well as foundation design and construction recommendations are presented herein.

Contents

Tables

Figures

Appendices

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1 Introduction

1.1 Purpose

The Newberry County Consolidated Fire District (the County) contracted HDR to perform engineering services to support installation of fire suppression water supply tanks on ten sites in eastern, central, and northeastern Newberry County, South Carolina.

1.2 Scope

This report is intended as a report of the findings of the subsurface investigation and foundation design recommendations for installation of an approximately 10-foot by 70-foot, 40,000-gallon fiberglass reinforced plastic (FRP) underground tank at each of the ten sites selected by the County. It is our understanding that the tanks will be used to supply firefighting water in rural areas where fire hydrants are unavailable. Our design recommendations are made in accordance with National Fire Protection Association (NFPA-22) requirements, manufacturer installation recommendations, generally accepted engineering practices, and our experience on similar projects. This report is not intended to be, nor should it be construed as, a construction specification.

2 Sites

The ten site locations were provided to us by the County. Table 2-1 lists the ten sites, in non-specific order assigned by HDR, as well as GPS coordinates. A map of the sites is provided in Appendix A of this report.

Table 2-1. Site Locations and Coordinates

Site Number and Description	Northing	Easting
1. Fire Station	34.401767	-81.573638
2. Fire Station	34.456252	-81.473912
3. Fire Station	34.312155	-81.396802
4. Fire Station	34.369818	-81.447944
5. Active Recycling Center	34.375666	-81.410662
6. Church	34.449300	-81.496040
7. Cleared Field (Near Residence)	34.391241	-81.474446
8. Turkey Farm	34.464223	-81.451891
9. Cleared Field (Near Residence)	34.342335	-81.450075
10. Wooded Area, adjacent to cleared field (Near Residence)	34.366501	-81.526476

Table 2-1. Site Locations and Coordinates		
Site Number and Description	**Northing**	**Easting**

Source: Newberry County

2.1 General Site Conditions

The ten sites were physically situated in eastern-central and northeastern Newberry County, South Carolina. The sites were generally flat to gently sloping and all but Site #10 are either cleared, grassed, or cultivated agricultural lands. Site #10 is located in a moderately wooded area adjacent to a private residence that will require clearing prior to construction. Table 2-2 below provides site specific information.

Table 2-2. General Site Conditions

Site	Rock Observed	Clearing Required	Topography	Utilities	Soil Boring	Comments
1	None.	None.	Gently Sloping	None	B8	Fire station on-site
2	None.	None.	Gently Sloping	None	B5	Fire station on-site
3	None.	None.	Gently Rolling to Flat	None	B1	Fire station on-site
4	Some visible near ground surface.	None.	Gently Sloping to Flat	Some Type of Warning Siren	B3	Fire station on-site
5	None.	None.	Gently Rolling	Overhead Power Lines, Probably Underground	B2	Active Recycling Center
6	None.	None.	Flat	Overhead Power Lines, Storm Drainage	B7	Church on-site
7	None.	None.	Flat	None	B10	In a cleared field
8	None.	None.	Flat	Well on Tree Line, Overhead Lines	B6	Active turkey farm on-site
9	None.	Tall grass.	Gently Sloping	Underground and Overhead Power Lines, Storm Drainage	B4	Boring in field across the street from a private residence with several outbulidings
10	None.	Moderately wooded.	Gently Sloping	Overhead Power Lines Near Road, None at Site	B9	Boring in wooded lot adjacent to private residence

2.2 General Site Geology

The ten Newberry County sites lie within the Piedmont physiographic province of South Carolina. The Piedmont consists of moderate to steep topography with soils predominantly derived from weathered rock and alluvial deposits.

Each of the proposed sites lie within the Charlotte Terrane, a complex of metasedimentary and metavolcanic rocks that are predominantly schistose with some gneissic zones, intruded by plutonic sequences including predominantly granite and minor gabbroic intrusions (Hibbard et al, 2013). The rock types underlying the sites vary within the aforementioned units. Sites 1 and 3 are within schistose/gneissic metamorphic rocks. Sites 2, 6, and 8 lie within a unit mapped as mylonitic gneiss, and Sites 4, 5, 7, 9, and 10 lie within the Newberry Granite (SCGS, 2017). Figure 2-1 presents the location of the sites relative to the geologic units.

The soils underlying each of the sites are residual soils derived in place from rock that underlies the sites. The soils underlying the sites vary somewhat based on USDA NRCS mapping. At Site 1, the soils are mapped as the Cecil sandy clay loam with 2 to 7 percent slopes and moderately eroded, and Hard Labor sandy clay loam with 2 to 6 percent slopes. Both are identified as residuum weathered from gneiss. At Site 2, the soils are mapped as Cecil sandy clay loam with 2 to 6 percent slopes weathered from gneiss and the Wynott-Winnsboro complex, 2 to 6 percent slopes described as residuum weathered from grano-diorite. Site 3 soil consists of the Cecil sandy clay loam derived from weathered schist or gneiss with 2 to 6 percent slopes. At Site 4 the Helena sand loam with 2 to 10 percent slopes derived from weathered granite and the Santuc loamy course sand, 2 to 6 percent slopes also residual soil derived from granite make up the soils. Site 5 soils consist of the Hard Labor sandy loam, 2 to 6 percent slopes, derived from weathered granite, and Wynott-Winnsboro complex, 2 to 6 percent and 6 to 10 percent slopes consisting of sandy loam, clay, and sandy clay loam derived from weathered diorite and gabbro. Site 6 soils consist of the Cecil sandy clay loam with slopes from 2 to 6 and 6 to 10 percent that are residual soils derived from weathered gneiss, the Rion Sandy loam, 15 to 25 percent slopes and Pacolet sandy clay loam 15-25 percent slopes both residual soils of weathered gneiss. Site 7 soils consist of the Cecil sandy clay loam having 2 to 6 and 6-10 percent slopes. These soils are residual soils derived from weathered granite. Site 8 soils consist of the Cecil sandy clay loam having 2 to 6, 6-10, and 7-15 percent slopes, and the Pacolet sandy clay loam having 15-25 percent slopes. All soils are residual soils derived from weathered gneiss. Site 9 soils consist of the Wynott Winnsboro complex having 2-6 percent slopes that is residual soil derived from weathered diorite or gabbro, the Cecil sandy clay loam with 2 to 6 and 6 to 10 percent slopes that is residual soil derived from weathered granite, and the Pacolet sandy clay loam having 15-25 percent slopes. Site 10 soils consist of the Cecil Sandy clay loam having 2 to 6 percent slopes also a residual soil derived from weathered granite. The predominant soil type across all ten sites is sandy clay loam. Sandy clay loam consists of 45 or greater percent sand, less than 28 percent silt,

and 20-35 percent clay. Coarse grained residual soils in the Piedmont are generally medium dense while fine grained residual soils typically have a consistency of medium stiff to very stiff.

While faults and shear zones are mapped in Newberry County (SCGS, 2017) there are no faults classified as active with the Quaternary (1.6 million years) in the vicinity of the ten sites (USGS, 2017).

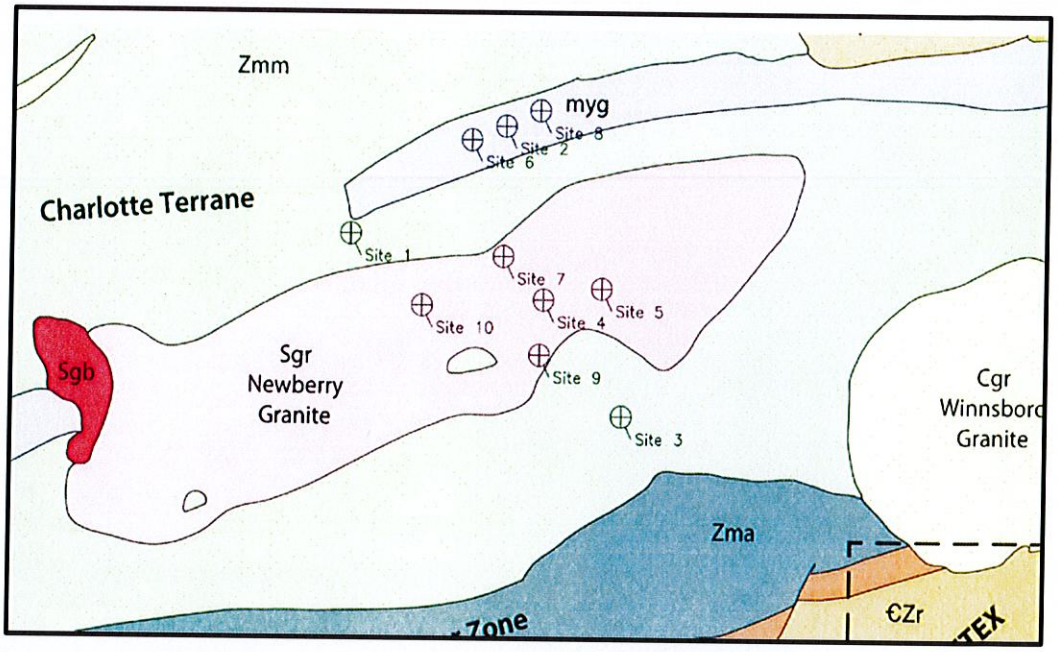

Figure 2-1. Geologic Units.

(Zmm-Charlotte Terrane (Schistose and Gneissic meta-sedimentary and metavolcanic rocks); Sgr-Newberry Granite (granitic to diorite intrusive igneous rocks).; myg-mylonitic gneiss; Zma-migmatitic gneiss and amphibolite.)

Source: United State Department of Agriculture Natural Resource Conservation Service, Web Soil Survey, https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

2.3 General Groundwater Conditions

Groundwater was encountered in boring B-10 at an approximate depth of 45-feet BEGSE, but it was not encountered in any of the other borings at the time of drilling. Variations in the groundwater elevation should be anticipated, since groundwater conditions can change based on rainfall, seasonal changes, construction activity, and other factors.

2.4 Screening for Seismic Hazards

HDR conducted a screening for seismic hazards at the proposed site locations to estimate potential for seismically induced shear strength loss (SSL) and ground motions. For estimation of seismic demands we have based our analyses on Reference 8.

The first step in our screening process involved the estimation of Seismic Site Class based on the IBC criteria, as detailed in Reference 8. The majority of the ten sites

were classified as Site Class D, which is defined as a site with "Stiff Soil" having an average shear wave velocity of 600 to 1,200 feet/sec in the upper 100 feet of the soil profile.

Site 3 was classified as Site Class C, "Very Dense Soil or Soft Rock" with an average shear wave velocity of 1,200 to 2,500 feet/sec. A classification of Site Class D was considered to be representative for all the proposed sites. Our estimation of Site Class was based on the soil borings with Standard Penetration Testing (SPT) blow counts conducted at each of the sites.

The USGS Seismic Hazards Mapping Tool, Reference 9, was then used to construct the horizontal acceleration response spectrum at the ground surface for both the Maximum Considered Earthquake (MCE) and the Design Earthquake using IBC criteria. Our analyses indicate that the design Peak Ground Acceleration (PGA) at the project sites will be 0.14g, or lower, where "g" is the acceleration due to gravity at sea level. The analyses for the response spectra are included in Appendix B of this report.

The soils encountered at the project site are primarily medium to dense mixes of residual sand and silt transitioning to rock or weathered rock at depths ranging from about 26 to 50 feet. Based on the observed soil conditions, the magnitude of the PGA at the project site, and the depth of embedment of the water tank footings (about 15 feet), we estimate that the foundation soils supporting the proposed water tanks have a low to very low potential for seismically induced shear strength loss caused by liquefaction. Ground improvements or other measures related to mitigation of seismic hazards are not needed or recommended, based on our screening.

3 Water Storage Tanks

3.1 Tank Dimensions and Loads

It is our understanding that the County will install 40,000-gallon FRP underground tanks made by DARCO, Inc., or a commercially available equivalent FRP tank product, at each of the proposed sites. For the purposes of this design, we utilized design criteria and recommendations for DARCO, Inc. brand FRP tanks. It is recommended that the Contractor confirm compatibility of the brand to be utilized with the DARCO installation recommendations presented herein. According to DARCO, the 40,000-gallon fiberglass reinforced plastic tanks measure approximately 10-feet in diameter, are 69-feet long, and weigh approximately 12,500-lbs empty.

3.2 Manufacturer Design Recommendations

The manufacturer provides installation recommendations for use with installation of their water tanks, and these recommendations were reviewed by HDR. Key portions of those recommendations regarding excavation, backfill, compaction, bedding material, anti-flotation anchors ("dead men"), construction Quality Assurance/Quality

Control, and traffic slabs, relative to the following sections of this report are reprinted for ease of reference in Appendices E through G.

The complete manufacturer installation brief may be downloaded at http://darcoinc.com/wordpress/wp-content/uploads/2016/08/FINISHED-IB-031416.pdf. The complete manufacturer installation manual may be downloaded at http://darcoinc.com/wordpress/wp-content/uploads/2017/03/Online-copy-FRP-Manual-2017.pdf.

4 Subsurface Investigation

4.1 Soil Borings

HDR drill crews mobilized to the sites on July 27, 2017, drilling one (1) boring to a target depth of 50-feet below existing finish grade elevation (BEGSE), or to auger refusal, whichever was shallower, at each of the proposed sites.

The borings were advanced utilizing 3.25-inch inside diameter continuous flight hollow-stemmed augers. In the upper 10-feet of each boring, disturbed samples were continually collected and standard penetration testing (SPT) was conducted. From 10-feet to boring termination depth, sampling and SPT testing were conducted at intervals of every 5-feet.

The boring locations were intended to correlate to the approximate center of the proposed tank location based the site location information provided by the County. Soil types were visually classified during drilling based on observation by HDR personnel in general accordance with the Unified Soil Classification System (USCS) as outlined in Reference 10. Boring logs were prepared for each boring. The logs contained the soil descriptions classified using USCS classifications with general correlations to the AASHTO soil classification system, SPT "N" counts, and lab tests results where applicable. The boring logs are provided in Appendix B of this report.

4.1.1 Boring Results

Table 4-1 provides a summary of the borings conducted at each site.

Table 4-1. Boring Information

Boring Number	Site Number	Boring Termination Depth (ft-BEGSE)	Rock Encountered
1	3	45.1	Yes, at 26.2 feet
2	5	47.8	Partially Weathered Rock
3	4	40.4	No
4	9	50.5	No
5	2	50.5	No

Table 4-1. Boring Information

Boring Number	Site Number	Boring Termination Depth (ft-BEGSE)	Rock Encountered
6	8	50.2	No
7	6	50.5	No
8	1	45.5	No
9	10	40.1	No
10	7	50.2	No

In general, site soils were classified as silty Sand (SM). There were some site soils that were classified as elastic Silt (MH), and three sites yielded soils classified as Silt (ML). Sandy soils from existing ground surface elevation to a depth of 20-feet BEGSE ranged in relative consistency from loose to very dense. Silts exhibited relative consistencies ranging from stiff to hard. Rock or partially weathered rock (PWR) was found shallower than 50-ft BEGSE on only two of the sites. However, splitspoon refusal, defined as an SPT blow count of 50 blows with a spoon advance of 2 inches or less (i.e. SPT N Count of 50/2"), typically occurred on most sites between 40 and 50-feet BEGSE. In the Piedmont soils that characterize these sites, splitspoon refusal typically occurs in PWR. Although soils on most sites could not be definitively characterized as PWR, it should be expected that PWR may be encountered at all ten sites.

The Boring Logs contained in Appendix B of this report provide site specific soils information including soil classifications, relative density/consistency, sample and testing information, and boring termination depth.

4.2 Sampling and Laboratory Testing

At each interval where SPT testing was conducted, disturbed soil samples were also collected. From the samples collected in each boring, selected samples were identified for laboratory testing to classify soil types and determine index properties.

Thin-walled metal tubes (Shelby Tubes) were intended to be collected from each boring from 18-feet to 20-feet BEGSE, to provide samples for laboratory shear strength testing. Recovery from Shelby tubes was only possible for three of the sites. Additionally, to develop site specific compaction standards to be used in construction, a composite sample of the top ten (10) feet of soil was collected. The results of the geotechnical laboratory testing are provided in Appendix C of this report. Table 4-2 on the following page summarizes sampling and testing plan.

Table 4-2. Sampling and Geotechnical Laboratory Testing Summary

Boring No.	Site No.	No. Samples	Shelby Tube	Tested Disturbed Sample No.'s	Laboratory Testing				
					Grain Size Hydrometer	Atterberg Limits	CU	Proctor	Unconfined Compression
1	3	13 and (3) Rock Cores	Yes	SS-7, SS-9	✓			✓	✓
2	5	15	Yes	SS-2, ST-1	✓	✓	✓	✓	
3	4	10 and (3) Rock Cores	Yes	SS-6, ST-1	✓			✓	
4	9	14	Yes	SS-5, ST-1	✓	✓		✓	
5	2	14	Yes	SS-2, SS-9	✓	✓		✓	
6	8	15	No	SS-7, ST-1	✓	✓	✓	✓	
7	6	14	Yes	SS-4, SS-9	✓	✓		✓	
8	1	13	Yes	SS-7, ST-1	✓	✓		✓	
9	10	12	Yes	SS-7, ST-1	✓	✓	✓	✓	
10	7	11	Yes	SS-7, SS-5	✓	✓		✓	

5 Foundation Design

5.1 Applied Loads

Applied loads for the water tank foundations were estimated as discussed in this section. Some loads were gathered from published literature. Other loads were calculated based on interpretation of these published values. The sources for our assumptions are detailed in the References Section of this report. Other load values were calculated from the results obtained from lab testing.

According to the County, no traffic slabs will be installed directly over the tanks at any of the sites. However, if the County does utilize a traffic slab over a tank, manufacturer recommendations may be provided by the tank manufacturer. Excerpts of the DARCO, Inc. recommendations pertaining to traffic slab installation over a tank are provided for reference in Appendix G of this report.

Table 5-1. Applied Loads

Load	Unit Wt.	Load (kip)	Derivation	Comments
Tank Water	62.4-lbs/ft^3	333.7	40,000 gal x 62.4-lbs/ft^3	The unit weight of water of 62.4-lbs/ft^3 is a generally accepted, published value.
Concrete Slab*	150-lbs/ft^3	255	85-ft x 20-ft x 1-ft	(1) 150- lbs/ft^3 is a generally accepted value for reinforced concrete. (2) The manufacturer recommends that the pad extend at least 1/2-diameter beyond each end and sidewall of the tank.
Concrete Dead Men	150-lbs/ft^3	33	(1-ft x 2-ft x11-ft)x 150 lbs/ft^{3}x10 dead men	Dimensions and number of dead men recommended by the manufacturer.
Stone Backfill	110-lbs/ft^3	1,856	(75-ft x 15-ft x15-ft) x 110-lbs/ft^3	(1) The unit weight of #57 stone is a value published by the SCDOT for this aggregate material (see the following section). (2) The design value was reduced by the volume occupied by the tank.

**Concrete traffic slab over the tank is a construction option and the County may choose not to use them. To conservatively estimate foundation loads, each site was modeled as if a slab would be constructed on it.*

5.2 Theory

Foundation design for the proposed water tanks consisted of verifying the bearing capacity of the bearing soil stratum, and estimating settlements beneath the proposed foundations at each site, as detailed in this section of the report. The water tanks will be supported on mat foundations of gravel 75-feet long by 15-feet wide by 1-foot thick. The tank and anchors are installed directly on this bedding layer.

Site specific bearing capacity was estimated using the Brinch-Hansen Equation, outlined in Reference 11, reprinted on the following page, as Equation 5-1.

$$(c'*N_C*F_{SC}*F_{DC})+(Q*N_Q*F_{SQ}*F_{DQ})+(0.4*\gamma*B*N_\gamma*F_{S\gamma}*F_{D\gamma}) \quad \textbf{Equation 5-1}$$

Settlement was analyzed using the Schmertmann Method as adapted by Bowles, as it appears in Reference 12. The equation is reprinted below as Equation 5-2.

$$\Delta_H=q_0*B'*(1-\mu_2/E_s)*I_s*I_F \quad \textbf{Equation 5-2}$$

NFPA-22 requires that Bearing Capacity be determined using a Factor of Safety of 3.0. The manufacturer guidelines recommend ideal soil strength parameters and minimum bearing capacity recommendations as follows:

Minimum Bearing Capacity: 2,500-lbs/ft^2 (vertical support)

Minimum Cohesive Strength: 500-lbs/ft^2 (sidewall stability)

We used these parameters as the acceptance criteria for our design.

Due to the silty nature of the foundation soils at each of the sites, the soils exhibited negligible cohesive strength. The lack of cohesion prompted additional excavation in order to satisfy the US Occupational Safety and Health Administration (OSHA) excavation safety requirements. Excavation dimension requirement determination is detailed in Section 6.2.2 of this report. The foundation soils at each of the sites, under the loading conditions described in Section 5.1 of this report, exceeded the minimum bearing capacity criteria.

Neither NFPA-22 nor the manufacturer recommendations provided a maximum settlement amount. NFPA-22 requires that settlements not "impair the structural integrity of the tank." Based on our analyses, the total bearing pressure at the base of the tank foundations following the end construction will be less than the existing vertical pressure prior to excavation. Therefore, we anticipate total and differential vertical settlements resulting from the proposed construction to be minimal, and less than about ¼ inch. The majority of the settlement is expected to occur during and within two weeks of the completion of construction at each of the sites. Since the predominant foundation soil type is silt and sand, negligible, if any, secondary settlement is expected. Differential settlement can be a concern with structures of this size, especially in soils of the nature encountered on these sites. Compaction as recommended in Section 6 of this report will greatly reduce the chances of the occurrence of differential settlements.

A full listing of the sources we used in our analyses and design is contained in Section 7.0 of this report.

5.3 Gravel Bedding and Backfill Material

The manufacturer recommendations require the tank to be bedded on a gravel pad that meets the minimum guidelines described on the following page.

- Rounded "pea gravel" ¼ to ½-inch diameter or crushed rock chips retained on the ¼ to ½-inch screen sizes
- Must have few stones (5% or less) that are greater than ½-inch in size
- Must have a unit weight of at least 100-lbs/ft^3
- Washed and free of fines and organics so that no more than 5% passes the #8 sieve

Source: DARCO, 2016 FRP Tank Installation Brief

The gravel used in our analyses is #57 Stone, with an assumed unit weight of 110-lbs/ft^3, and a gradation from the SCDOT Standard Specifications for Highway Construction as shown in Figure 5-1 on the following page. We recommend that for bedding and backfill, gravel meeting the #57 stone gradation be used on this project. A copy of this gradation is provided for reference in Appendix E of this report.

Gradation of Coarse Aggregates Percentage by Weight Passing Sieves Having Square Openings										
Sieve Designation	Aggregate No.									
	CR-14	5	56	57	67	6M	8M	78	789	89M
2-inch	100	--	--	--	--	--	--	--	--	--
1½-inch	95 - 100	100	100	100	--	--	--	--	--	--
1-inch	70 - 100	90 - 100	90 - 100	95 - 100	100	100	--	--	--	--
¾-inch	--	20 - 55	40 - 85	--	90 - 100	90 - 100	100	100	100	--
½-inch	35 - 65	0 - 10	10 - 40	25 - 60	--	--	95 - 100	90 - 100	95 - 100	100
⅜-inch	--	0 - 5	0 - 15	--	20 - 55	0 - 20	75 - 100	40 - 75	80 - 100	98 - 100
No. 4	10 - 40	--	0 - 5	0 - 10	0 - 10	0 - 5	10 - 35	5 - 25	20 - 50	20 - 70
No. 8	--	--	--	0 - 5	0 - 5	--	--	--	--	2 - 20
No. 16	--	--	--	--	--	--	0 - 5	0 - 5	0 - 6	--
No. 100	--	--	--	--	--	--	0 - 2	--	0 - 2	0 - 3

Figure 5-1. SCDOT Coarse Aggregate Gradation.
Source: South Carolina Department of Transportation, 2007 Standard Specifications for Highway Construction, Appendix

6 Construction Recommendations

6.1 General

We recommend that the Contractor follow the tank installation, handling, and storage procedures outlined in References 2 and 3 of this report, as well as the Project Specifications prepared by HDR for construction of this project. We also recommend that one site be completely excavated, have the tank installed, and be completely backfilled to finished grade elevation *before* beginning work at another location. Under no circumstances should an excavation be left open for a total of more than 3 days.

Groundwater was only encountered in boring B-10, but not in any of the other soil borings at the time of drilling. Groundwater elevation can vary based on rainfall, seasonal factors and construction activity. The Contractor should anticipate the potential presence of groundwater in the excavations during construction. A pump should be maintained at the site to expeditiously remove accumulating rainfall, stormwater runoff, or groundwater intrusion. It is also strongly recommended that excavations do remain open longer than 24 hours without placing bedding and backfill material. Under no circumstances should an excavation remain open over a weekend or other period of extended time away from any site.

6.1.1 Generalized Installation Process

We anticipate that tank installation will entail the generalized steps in the sequence outlined below. For specific steps and recommendations for each step, the reader is directed to the corresponding sections of this report, the Project Plans and specifications, and the manufacturer recommendations.

General Installation Sequence

- Clearing and grubbing.
- Excavation to the lines, grades, and a minimum depth of 15-feet BEGSE, as indicated in the construction plans.
- Preparing the subgrade.
- Constructing the deadmen anchors as recommended in Section 6.4 of this report.
- Installing 12-inches of bedding material (#57 stone) that meets the gradation recommendations outlined in the previous section.
- Placing the tank and deadmen.
- Backfilling around the tank with #57 stone to a minimum of 1-foot above the top of the tank as recommended in Section 6.3 of this report.
- Using a vibratory plate compactor, place and compact the stone and backfill soil.
- Completing construction and installing appurtenances as indicated in the Project Plans and Specifications.

6.2 Excavation

The dimensions outlined in Table 6-1 were assumed in our analysis. Excavation dimensions include the manufacturer recommended additional excavation of a minimum of 2-feet beyond each end of the tank and a minimum of 2-feet beyond each tank sidewall. To facilitate the installation of deadmen anchors and to allow for CQA/QC testing, we had designed the excavation for 3-feet of additional excavation beyond the sidewalls and ends of the tanks.

Additionally, to allow for 1-foot of bedding material under the tank, it will be necessary to excavate 1-foot below tank base elevation. Therefore the excavation dimensions shown in Table 6-1 are recommended and a schematic of the excavation is shown in Figure 6-1:

Table 6-1. Excavation Dimensions

Tank Area Excavation (Irregularly Shaped)	
Dimension	**(feet)**
Length	75
Width	16
Depth	15*
End/Side Slope Excavation	
Depth	11
Length	16.5
Slopes	1.5H:1V

**Depth includes 1-foot of additional excavation to allow for installation of bedding material.*

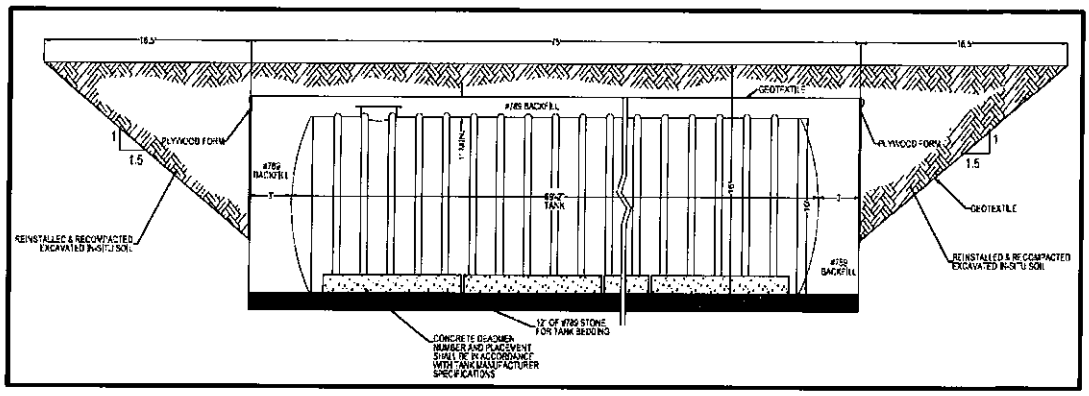

Figure 6-1: Excavation Layout Schematic (NTS)

6.2.1 Excavation Stability

Both NFPA and the manufacturer recommendations require vertical sidewall stability within the excavation. Both sources refer the Engineer to OSHA excavation requirements to ensure the safety of workers installing and backfilling the tank. A cursory examination of the soils from each site was made and compared to OSHA excavation requirements by soil type. HDR has not performed any type of engineering analysis for slope stability. The Contractor should perform an independent analysis to confirm our results prior to performing any construction activities.

OSHA Requirements

HDR, using 29 CFR § 1926 Subpart (P) OSHA Excavation and Trenching Regulations, References 14 and 15, developed these preliminary excavation recommendations for each site. The regulations required first determining the soil type and generalized soil strength parameters, including cohesive strength. These factors then dictated the shape and maximum slope of sidewall and endwall excavations.

Based on the boring logs and lab results, HDR assessed the soils as Class B, soils as defined by the excerpt from the OSHA Regulations:

> *Type B* – Includes cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa) and granular cohesionless soils (such as angular gravel, similar to crushed rock, silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam). See *Appendix A to Subpart P of Part 1926, paragraph (b) — Definitions (Type B)*, for a detailed definition of Type B soil.
>
> *Source: OSHA 2226-10R, 2015 Trenching and Excavation Safety*

Some sites exhibited varying soil strata within 20-feet BEGSE, which could trigger different OSHA slope configuration. However, even in a layered condition, the differing soil layers were still met OSHA Type B soils criteria.

Therefore, HDR recommend the tank excavations, for each site, with the slope configuration shown in Figure 6-2.

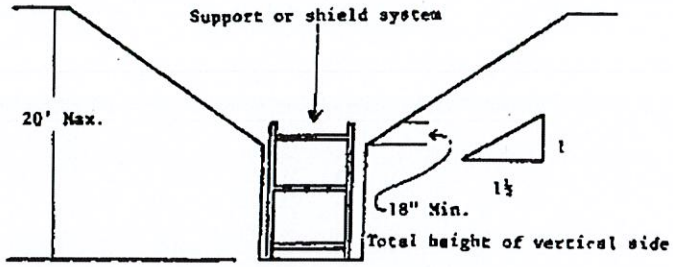

Figure 6-2. OSHA Type B Soils Allowable Excavation Configuration.
Source: OSHA Website

6.3 Preparation for Bedding

The subgrade should be prepared by removing any loose soils, organic materials, and/or other deleterious materials from the base of the excavation. Groundwater entering the excavation and collecting in the bottom should be pumped out continuously. It should be verified that it is uniformly excavated to a depth of 15-feet BEGSE. Using either a vibratory plate compactor or a remote controlled, walk-behind vibrating sheeps foot roller (a "Rammax"), the subgrade should be compacted to an in-situ relative compaction of 95%, as determined by the Standard Test Methods for Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit, Method A (ASTM D-4914). "Jumping Jack" type compaction equipment is not recommended for use on this project.

6.4 Tank Anti-Flotation Anchoring

To counteract buoyancy forces of a partially-filled tank, periods of sustained rainfall, temporary rise in groundwater surface elevation beyond those encountered during drilling, or other temporary or permanent situations whereby water could enter the tank excavation, we recommended that foundation anchors ("deadmen") be installed.

We have designed for and require that the tanks be anchored using deadmen anchors, as outlined in the manufacturer recommendations. Those guidelines recommend using six (6) 24-inch wide by 12-inch thick by 11-feet long, half-round, anchors on each side of the tanks, for a total of twelve anchors. Alternate configurations for the deadmen are available through the manufacturer.

Excerpts, including a schematic, downloaded from the manufacturer's website and other pertinent information from the DARCO, Inc. FRP Tank Installation Brief and the DARCO Installation Instruction Manual, are reprinted in Appendix D of this report.

6.5 Backfill and Cover

Manufacturer recommendations require the tank to be fully encased in the gravel backfill, detailed in Section 5.2 of this report, to a minimum of 1-foot higher than the top of tank elevation, as depicted in Figure 6-1. It is recommended that gravel backfill be placed using a tremie or chute, rather than directly dumping (i.e. "tailgating"), to direct the gravel into the excavation without damaging the tank.

Gravel should be placed in 12-inch loose lifts and compacted with a vibratory plate compactor, as directed in the manufacturer installation recommendations.

Compacted soil backfill may be used to backfill the excavation above the gravel backfill to the ground surface, possibly with reinforced concrete slabs installed around key appurtenances. As shown on Figure 6-1, a portion of the side and end slopes may be backfilled with compacted soil; however the Contractor may choose to use gravel backfill in these areas at his discretion.

If soil backfill is to be used, once gravel backfill has reached a height of 1-foot above the top of the tank and prior to placement of any soil, a non-woven geotextile separation fabric, such as US Fabrics US-180NW or equivalent should be installed to prevent migration of soil into the gravel backfill. A copy of the product reference sheet is provided in Appendix E of this report for reference.

According to OSHA excavations standards a wide excavation will be necessary. To help reduce construction cost and to facilitate construction, the manufacturer recommendations allow tank installation using a treated plywood separation wall that completely surrounds the tank. The wall is then backfilled with gravel. If such a wall is used, it should be situated no less than 3-feet beyond each side and each end of the tank, as shown in Figure 6-1. The wall should be constructed and installed as outlined in the excerpts from the manufacturer recommendations, reprinted in Appendix E of this report.

Soil used as backfill should meet the following criteria:

- Free of organics, trash, roots, and other deleterious materials
- Have less than 5% of soil retained on the #4 sieve and no more than 25% passing the #200 sieve
- Have a USCS classification of SC, SM, SW-SC, or SW-SM
- Have Liquid Limit ≤ 40, a Plasticity Index ≤ 15

Backfill soils should be compacted to 95% of the Maximum Dry Density and within $\pm$ 2% of the Optimum Moisture Content as determined in an AMRL certified geotechnical testing laboratory, through the Standard Proctor Determination (ASTM D698).

6.6 Quality Control Recommendations

We recommend that a Construction Quality Assurance/Quality Control (CQA/CQC) Plan be developed prior to commencing construction.

The plan should include CQA/CQC testing recommended in the manufacturer installation recommendations, excerpts of which have been provided in Appendix F of this report.

The CQA/CQC plan should contain procedures, references, and methods for addressing areas that do not comply with required standards for the following:

- Hydrostatic leak testing
- Methods for determining that the subgrade meets the minimum relative density recommendations outlined in Section 6.3
- Procedures for probing from the "4:00 position to the 8:00 position" for every lift, after it has been properly compacted
- Methods for determining the compaction of soil backfill

7 References

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