

Contract Documents
And
Specifications for
Kingstree Middle Magnet School
Parking Lot Addition

Invitation to Bid No. WCSD201819-03

Williamsburg County School District

December 2018

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Williamsburg County School District

Invitation to Bid No. WCSD 201819-03

Kingstree Middle Magnet School Parking Lot Addition

Sealed Bids will be received from qualified and professional vendors to construct a parking lot, sidewalks and infiltration pond and as described below:

As per the attached plans: The successful bidder shall construct a parking lot, sidewalks and infiltration pond as per the referenced drawings and associated specifications.
Sealed bids will be opened on January 31, 2019 at 2pm at Williamsburg County School District

Bids shall be opened promptly at the above stated time and date and their contents will be made public for the information of the bidder and others properly interested. The bid will not be awarded until the Procurement officer and the applicable Department Director have had ample time to review each bid.

Bids must be submitted in sealed envelopes with the bid number clearly marked “**Bid No. WCSD 201819-03**” on the outside of the envelope for easy identification by the town of Kingstree. Bids may be hand delivered to the address noted above. Any bids received later than the specified time will not be accepted or considered. The city will not be responsible for late submission caused by the postal service, other carriers, or any other delivery problems regardless of the reason. Bids may be hand delivered. Bids submitted by mail, Federal Express, United Parcel Services, Etc. must meet these same requirements and shall be addressed:

Williamsburg County School District
Attn: Michael Barrineau
500 N. Academy Street, Building D
Kingstree, SC 29556

Williamsburg County School District reserves the right to engage in discussions with any or all responsible Bidders who submit bids which appear to be eligible for award, for the purpose of clarification to assure full understanding of and responsiveness to the invitation to bid requirements herein.

This solicitation does not commit the Williamsburg County School District to award a contract/purchase order, to pay any costs incurred in the preparation of a proposal, or

procure or contract for services. The Williamsburg County School District reserves the right to reject any and all responses to cancel this solicitation, and to make an award deemed in its own best interest.

MINORITY AND WOMEN OWNED BUSINESS

Minority Business Owners (minority or women owned businesses) will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, creed, sex or national origin in consideration for an award. It is the policy of the Williamsburg County School District that minority business and women business enterprises (MBE/WBE) have an opportunity to participate at all levels of contracting in the performance of Williamsburg County School District contracts to the extent practical and consistent with the efficient performance of the contract.

The successful contractor must ensure that all subcontractors, agents, personnel assigned by or employees of prime contractor and subcontractors are not discriminated against because of their race, color, religion, sex, or national origin. Bidders must make positive efforts to provide equal employment opportunity for minority and women owned businesses.

BIDDER'S QUALIFICATIONS

The successful bidder must have no less than five (5) years experience in this type of work and be licensed in the state of South Carolina. No bid will be considered unless the bidder is legally qualified under the state of South Carolina Tax License and License requirements; S.C. Code 1952, Volume V, Chapter 8, Section 56-410 through Section 56-428, as amended.

Before the award of contract/purchase order, any bidder may be required to show that they have the necessary license facilities, experience, ability, and financial resources to perform the work in a satisfactory manner. Bidders may be required to furnish the Williamsburg County School District with sworn statements as to their experience. No contract/purchase order will be awarded except to responsible bidders capable of performing the class and type of work required.

INSTRUCTION TO BIDDERS

In order to ensure a sincere and reasonable effort on the Contractor's part to accomplish the work in a timely fashion, delay damages due to inconveniences to the owner for the work not being accomplished on time will be at the rate of five hundred dollars (\$500.00) per day. The Contractor should realize that delays due to bad weather, materials and such, not under the control of the Contractor will be considered by the Engineer for time extension.

No bid may be withdrawn for a period of sixty (60) days after the bid opening date.

Bids must be signed by an individual legally authorized to offer the pricing and response to this invitation to bid. Any bid that is not signed will not be accepted.

All bidders must follow the specifications outlined in this bid document. Any bidder who finds discrepancy in or omission from the specifications, or is in doubt as to their meaning, or feels that the specifications are discriminatory, shall notify the Williamsburg County School District Procurement Officer in writing not later than 5 days prior to the scheduled opening of bids.

The Williamsburg County School District will assume no responsibility for oral instructions or suggestions. All official correspondence in regard to the specifications should be directed to and will be issued by the Williamsburg County School District Procurement Officer.

DEFINITIONS: Responsible Bidder means a bidder who has the capability in all respects to fully perform contract requirements, and the integrity and reliability which will assure good faith performance.

Responsive Bidder means a bidder who has submitted a bid which conforms in all material respects to the invitation to Bid.

PROTEST: Any actual or prospective vendor, bidder, or contractor who is aggrieved in connection with the solicitation or award of a contract may formally protest to the Financial Director. The protest shall be submitted in writing within seven (7) days after such aggrieved person or party knows or should have known of the facts giving rise thereto.

DISPUTES: In cases of disputes as to whether or not an item or service quoted or delivered meets the specifications, the decision of the Williamsburg County School District shall be final and binding on all parties. The Procurement Officer may request in writing, the recommendation of the head of the Williamsburg County School District agency using the item or other objective sources.

EXCEPTIONS: Exceptions taken do not obligate the School District to change the specifications. The Williamsburg County School District Procurement Officer will notify all bidders in writing, by addendum duly issued, of any interpretations made of specifications or instructions.

DEVIATIONS: Any deviations from specifications contained herein must be noted in detail on the bidder's bid response for the Williamsburg County School District's consideration. Failure to submit documentation of deviations shall be grounds for rejection of the item offered to the Williamsburg County School District.

CHANGES: Any changes in this Invitation to Bid after the purchase order/contract agreement has been awarded must be with the written consent of the Procurement Officer otherwise, the responsibility for such changes lies with the vendor.

INQUIRIES: All technical questions concerning this invitation to bid shall be made in writing and directed to **William Ervin (843) 662-4941**, wce@ervinengineering.com. All

questions concerning the bid process shall be directed to **Michael Barrineau with the Williamsburg County School District**. The email address of the **Williamsburg County School District** is **mbarrineau@wcsd.k12.sc.us**. If necessary, The **Williamsburg County School District** may refer questions to the Engineer, William C. Ervin, Jr. of Ervin Engineering Co., Inc.

A complete copy of the Williamsburg County School District Purchasing Policies are available by contacting: mbarrineau@wcsd.k12.sc.us.

CRITERIA FOR AWARD

The bid will be awarded to the lowest responsible/responsive bidder that best meets the Williamsburg County School District's specifications/scope of work, taking into consideration the following but not limited to:

- A. Price
- B. Experience of company
- C. Past performance based on references
- D. Timeliness of completion
- E. Geographical location of bidder's place of business (including service facility) in relation to Kingstree, SC
- F. Warranty

BOND REQUIREMENTS

Each bidder must deposit with this bid a bid bond in the amount of 5% of the total bid.

A performance and payment bond, each in the amount of 100% of the contract price will be required of the successful vendor. The successful vendor will be required to furnish the required Performance and Payment Bonds within ten (10) business days after written notice of formal award of contract. Work will be required to commence within ten (10) days of written notice to proceed by the Engineer.

LIQUIDATED DAMAGES

In order to ensure a sincere and reasonable effort on the Contractor's part to accomplish the work in a timely fashion, delay damages due to inconveniences to the owner for work not being accomplished on time will be at the rate of five hundred dollars (\$500.00) per day. The Contractor should realize that delays due to bad weather, materials, and such, not under the control of the Contractor will be considered by the Engineer for time extension.

TAXES

The project pays Williamsburg County, SC Sales Taxes in the amount of 7%. However, the Williamsburg County School District is exempt from Federal Excise Taxes and will issue exemption certificates if requested.

BUSINESS LICENSE REQUIREMENT

It is required that each contractor and all subcontractors awarded a contract agreement with the Williamsburg County School District, either secure a Kingstree business license or update their current business license for the contract amount for any work that is to be done inside the city limits.

REQUIRED INSURANCE INFORMATION

The vendor shall agree to hold harmless, indemnify and defend the Williamsburg County School District, South Carolina, its agents and employees from any claims for property damage or personal injury (including death resulting therefrom). Such claims include, but are not limited to, actual, consequential, incidental or punitive damages. The vendor shall agree to maintain sufficient comprehensive general liability insurance, naming the Williamsburg County School District, South Carolina, as additional insured, in the amounts of \$1,000,000.00 per occurrence and \$1,000,000.00 per person. Proof of such insurance shall be given to the Procurement Officer by an appropriate certificate-of-insurance issued by the vendor's insurance agent.

Further, the vendor shall agree to insure prior to commencement of work on the project (job), all subcontractors, agents, assigns or employees of prime vendor and subcontractor shall agree to hold harmless, indemnify and defend the Williamsburg County School District, South Carolina, its agents and employees from any claims for property damage or personal injury (including death resulting therefrom). Such claims include but are not limited to, actual, consequential, incidental or punitive damages. Further, prior to commencement of work on the project (job), the vendor shall insure that all subcontractors, agents or assigns of the vendor, maintain sufficient comprehensive general liability insurance, naming the Williamsburg County School District, South Carolina, as additional insured, in the amounts of \$1,000,000.00 per occurrence and \$1,000,000.00 per person. Proof of insurance shall be given to the Procurement Officer by an appropriate certificate-of-insurance issued by applicable entity's insurance agent.

With regards to comprehensive general liability insurance, claims may be made during or after the term or terms of the contract/purchase order agreement.

Vehicle liability insurance with minimum combined single limits of \$1,000,000.00 per occurrence shall be maintained by the vendor.

The successful firm shall take out and maintain, during the life of the contract agreement, workers' compensation and employer's liability insurance for all employees to be engaged in services on this project under this agreement in an amount not less than \$1,000,000.00,

and in case any such services are sublet, the firm shall require all subcontractor(s) also to provide worker's compensation and employer's liability insurance in an amount not less than \$1,000,000.00 for all of the subcontractor's employees to be engaged in such.

INSPECTION/ACCEPTANCE

The **Williamsburg County School District** and a representative of **Ervin Engineering** shall conduct an inspection of the assigned work. No payment is to be made until an approved inspection is made.

INFORMATION FOR BIDDERS

BIDS will be received by The Williamsburg County School District herein called the Owner, at 500 North Academy Street, Kingstree, SC 29556 until 2 o'clock P.M. on January 31, 2019, then and there at said office to be publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to The Williamsburg County School District, Attn: Michael Barrineau, 500 North Academy Street, Kingstree, SC 29556. Each sealed envelope containing a BID must be plainly marked on the outside as BID for **Williamsburg County School District – Kingstree Middle Magnet School Parking Lot Addition** and the envelope should bear on the outside, the name of the BIDDER, his address, his license number, and the name of the project for which the BID is submitted. If forwarded by mail, the sealed envelope containing the BID must be enclosed in another envelope addressed to the OWNER at same address as above marked as indicated.

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink or typed and the BID form must be fully completed and executed when submitted. Only one copy of the BID form is required.

The OWNER may waive any informalities or minor defects or reject any and all BIDS. Any BID may be withdrawn prior to the above scheduled time for the opening of BIDS or authorized postponement thereof. Any BID received after the time and date specified shall not be considered. No BIDDER may withdraw a BID within sixty (60) days after the actual date of the opening thereof. Should there be reasons why the contract cannot

be awarded within the specified period; the time may be extended by mutual agreement between the OWNER and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID Schedule by examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the quantities of work or of the nature of the work to be done.

The OWNER shall provide to BIDDERS prior to bidding, all information which is pertinent to, and delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the project. Information obtained from an officer, agent, or employee of the OWNER, or any other person, shall not affect the risks or obligations assumed by the contractor or relieve him from fulfilling any of the conditions of the contract.

Each BID must be accompanied by a BID BOND payable to the OWNER for five percent (5%) of the total amount of the BID. As soon as the BID prices have been compared, the OWNER will return the bonds of all except the three lowest responsible bidders. When the Agreement is executed, the bonds of the two remaining unsuccessful bidders will be returned. The BID BOND of the successful bidder will be retained until the PAYMENT BOND and PERFORMANCE BOND have been executed and approved, after which it will be returned. A certified check may be used in lieu of a BID BOND.

A PERFORMANCE BOND and a PAYMENT BOND, each in the amount of one hundred percent (100%) of the contract price, with a corporate surety approved by the OWNER, will be required for the faithful performance of the contract.

Attorneys-in-fact who sign bid bonds or payment bonds and performance bonds must file with each bond a certified and effective dated copy of their Power of Attorney.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the performance bond and payment bond within ten (10) calendar days from the date when the Notice of Award is delivered to the BIDDER. The Notice of Award shall be accompanied by the necessary Agreement and bond forms. In case of failure of the BIDDER to execute the Agreement, the OWNER may, at his option, consider the BIDDER in default, in which case the Bid Bond accompanying the proposal shall become the property of the OWNER.

The OWNER, within ten (10) days of receipt of an acceptable Performance Bond, Payment Bond, and Agreement signed by the party to whom the Agreement was awarded, shall sign the Agreement. If the OWNER does not execute the Agreement within such period, the BIDDER may, by WRITTEN NOTICE, withdraw his signed Agreement. Such Notice of Withdrawal shall be effective upon receipt of the notice by the OWNER.

The NOTICE TO PROCEED shall be issued within ten (10) days of the execution of the Agreement by the OWNER. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period; the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten day period or within the period mutually agreed upon, the

CONTRACTOR may terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability of the BIDDER to perform the work, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the work contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the lowest responsive, responsible, BIDDER.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the contract documents. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to his BID.

The low BIDDER shall supply the names and addresses of major material suppliers and subcontractors when requested to do so by the OWNER.

Inspection trips for prospective BIDDERS will leave from the office of the **ENGINEER** by appointment only.

The ENGINEER is William C. Ervin, Jr., P.E. Ervin Engineering Co., 341 West Evans Street, Florence, S. C. 29501.

SECTION 201 - SPECIAL CONDITIONS

201.1 Contract Documents

201.1.1 All documents listed herein are a part of this contract and the requirements of each part shall apply to the entire project as may be applicable. CONTRACT DOCUMENTS covering the work under this contract consist of the following items:

1. Specifications dated [December 2018](#) revised [N/A](#) and entitled **Contract Documents and Technical Specifications for the Kingstree Middle Magnet School Parking Lot Addition - The Williamsburg County School District** containing all the sections listed in the Table of Contents, and all addenda and amendments thereto.
2. Plan drawings dated December 2018, and entitled **Kingstree Middle Magnet School Parking Lot Addition - The Williamsburg County School District** including all revisions thereto.

201.2 Contract Documents

201.2.1 Contract documents will be furnished as follows:

1. Bidders may purchase plans, specifications and bid documents for bidding purposes from the Engineer upon payment of \$ [200.00](#) for each set. (Non-Refundable)
2. Successful bidders will be furnished, without charge, two sets of contract documents for contract record purposes and up to four sets of specifications and plans for project and file use. Additional plans and/or specifications will be provided at reproduction and assembly cost.

202.1 Project Completion Time

202.1.1 Work on the project shall begin within the start date stipulated in the Contract Documents and shall be completed within 90 consecutive calendar days. TIME IS OF THE ESSENCE.

203.1 Liquidated Damages

203.1.1 Liquidated damages shall be assessed for projects not meeting project completion time as set forth in 202.1 above. Liquidated damages for this project shall be \$ 500.00 per day. Exceptions for liquidated damages are given under "General Conditions", Section 15.

204.1 Bid Submittal

204.1.1 All bids should be filled out completely and show all information requested. Information to be included follows:

1. Company name, address, current date, project name and all applicable license numbers should be shown on the exterior of the bid envelope.
2. All bids are to be submitted on the extra copy of the bid form included in the Contract Documents.
3. All material specifications and supplier information requested should be shown. Only one supplier should be shown for each item.
4. Bids should be signed by an authorized agent of the bidder.
5. All addenda should be acknowledged on the bid form.
6. Bid bonds should be properly executed and enclosed in the bid envelope.

205.1 Manufacturers Special Instructions Cited

205.1.1 Manufacturers' installation guides and recommended procedures are to be used in all instances that are not specifically covered by the specifications. Specific literature cited as applicable to this project is [none](#).

BID

Williamsburg County School District

Proposal of _____, hereinafter called "BIDDER", organized and existing under the Laws of the State of _____, doing business as* _____,

To _____, hereinafter called "OWNER".

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all work for the construction of:

strict accordance with the Contract Documents within the time set forth therein and at the prices stated below.

By permission of this Bid, each BIDDER certifies, and in the case of a joint Bid, each party thereto certifies as to his own organization, that this Bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid with any other BIDDER or with any competitor.

BIDDER here agrees to commence work under this Contract on or before a date to be specified in the Notice to Proceed and to fully complete the Project within 90 consecutive calendar days thereafter. _____.

BIDDER further agrees to pay as liquidated damages in the amount stated in the Special Conditions for each consecutive calendar day thereafter as provided in Section 15 of the General Conditions.

*Insert: "a corporation", "a partnership", or "an individual", as applicable.

BIDDER acknowledges receipt of the following ADDENDUM:

BIDDER hereby agrees that preference will be given to domestic construction material and further agrees to require subcontractors, material men and suppliers to also give preference to domestic construction material.

BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following Unit prices or Lump Sum:

(See Bid Schedule on Following Pages)

Kingstree Middle Magnet School Parking Lot

Itemized Bid

No.	Description	Quantity	Unit	Unit Price	Total
1	Removal of Existing Fence	1	LS		
2	Silt Fence	1200	LF		
3	Grassing	1	LS		
4	Asphalt Light Duty	3100	SY		
5	Aggregate Light Duty Base Course	3100	SY		
6	Asphalt Heavy Duty (in SCDOT ROW)	127	SY		
7	Aggregate Base Course (in SCDOT ROW)	127	SY		
8	Striping	1	LS		
9	Construction Entrance	1	LS		
10	Concrete Washout	1	LS		
11	Install New Fencing	311	LF		
12	Concrete Sidewalks	1985	SF		
13	Rough Site Grading	1	LS		
14	Finished Site Grading	1	LS		
15	4" Top Soil over all grassed areas	1	LS		
16	Disposal of excess material off site	1	LS		
17	Traffic Control	1	LS		
		Total Base Bid			
<u>Potential Additional Items:</u>					
		Quantity	Unit	Unit Price	
1	Muck and Fill		CY		
Add Alternate #1: Paving of Bus Loop Driveway					
1	Aggregate Base (Heavy Duty)	702	SY		
2	Asphalt (Heavy Duty)	702	SY		
		Total Add Alternate #1			

Written Total Base Bid _____ **DOLLARS**

Respectfully submitted:

Signature

Address

Title

Date

License Number (if applicable)

May be provided later but before contract award.

SEAL - if BID is by a corporation.

ATTEST: _____

SC ILLEGAL IMMIGRATION REFORM ACT

By signing this bid or proposal, the Contractor certifies that it will comply with, and will remain in compliance with during the term of the contract, the applicable requirements of Title 8, Chapter 14 of the South Carolina Code of Laws and agree to provide to the Williamsburg County School District upon request any documentation required to establish either:

(a) that Title 8, Chapter 14 is inapplicable both to the Contractor and its subcontractors and/or sub-subcontractors; or

(b) that both the Contractor and its subcontractors and/or sub-subcontractors are in compliance with Title 8, Chapter 14.

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BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE _____

as Principal, hereinafter called the Principal, and _____

a corporation duly organized under the laws of the State of

_____ as Surety, hereinafter called the Surety, are held and firmly bound
unto _____

as Obligee, hereinafter called the Obligee, in the sum of _____

_____ Dollars (\$ _____),

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind
ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally,
firmly by these presents.

WHEREAS, the Principal has submitted a bid for _____

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall
enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond

or bonds as may be specified in the bidding or Contract documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, 20__ .

Witness

Principal's Name & Title (Seal)

Witness

Surety's Name & Title (Seal)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____
(Name & Address)

as Principal, hereinafter called Contractor, and _____
(Name & Address)

as Surety, hereinafter called Surety, are held and firmly bound
unto _____
(Name and Address of Owner)

as Oblige, hereinafter called Owner, in the amount of -
_____ Dollars (\$_____)

for the payment whereof Contractor and Surety bind themselves,
their heirs, executors, administrators, successors and assigns,
jointly and severally, firmly by these presents.

WHEREAS, _____,

Contractor has by written agreement dated _____, 20__,
entered into a contract with Owner for _____

in accordance with Drawings and Specifications prepared by _____

Ervin Engineering Co., Inc. PO Box 3, Florence, SC 29503
(Name & Address of Engineer)

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

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if
Contractor shall promptly and faithfully perform said Contract,
then this obligation shall be null and void; otherwise it shall
remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and is declared by Owner to be in default under the Contract,
the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the
default, or shall promptly --

1. Complete the Contract in accordance with its terms and conditions, or
2. Obtain a bid or bids for completing the Contract in accordance with its terms and conditions,
and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon
determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a
contract between such bidder and Owner, and make available as Work progresses (even though
there should be a default or a succession of defaults under the contract or contracts of completion
arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the
contract price; but not exceeding, including other costs and damages for which the Surety may be
liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the
contract price," as used in this paragraph, shall mean the total amount payable by Owner to

Contractor under the Contract and any amendments thereto less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this _____ day of _____, 20__.

Witness Principal & Title (Seal)

Witness Surety & Title (Seal)

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

that _____

(Name & Address of Contractor)

as Principal, hereinafter called Principal, and

(Name & Address of Surety)

as Surety, hereinafter called Surety, are held and firmly bound

unto _____

(Name and Address of Owner)

as Obligee, hereinafter called Owner, for the use and benefit of

claimants as herein below defined, in the amount of _____

_____ Dollars (\$_____),

for the payment whereof Principal and Surety bind themselves,

their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by

these presents.

WHEREAS, _____ Principal has by

written agreement dated _____, 20 __, entered into

a contract with Owner for _____

in accordance with Drawings and Specifications prepared by

(Name & Address of Engineer)

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

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor, and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a. Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be severed by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b. After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c. Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project or any part thereof is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this _____ day of _____, 20__.

Witness Principal & Title (Seal)

Witness Surety & Title (Seal)

LOCAL AND MINORITY BUSINESS ENTERPRISE PURCHASING PROGRAM:

When lowest bid is the principal determining factor in a bid selection process it is the intent of the Williamsburg County School District to provide preference first to local businesses within Williamsburg County; however, if no local business is eligible or able to participate, preference shall then be provided by to minority business enterprises based on the following guidelines:

- a. For purposes of this policy, a “local business” is defined as a person, firm, contractor, corporation, or other business entity offering the services and/or products being bid by the Williamsburg County School District that maintain a place of business and have a physical business address located and operating within Williamsburg County. The business must have been established for not less than one year within the Williamsburg County School District and have a valid Town of Kingstree Business License for a minimum of 12 months prior to the bid date.
- b. For purposes of this policy, a minority business enterprise (MBE) is defined as an MBE that is certified in accordance with South Carolina Regulations § 19-445.2160, as authorized by §11-35-5270 the South Carolina Code of Laws, as amended.
- c. When lowest bid is the principal determining factor in the selection process any “local business” as defined in Subsection A above that submits a responsible and responsive bid within 5% (if the business is located within the Town of Kingstree) or 3% (if the business is located within Williamsburg County) of the non-local bidder who submitted the lowest bid may match the bid submitted by the non-local bidder. A “local business” that is within the percentage guidelines of the lowest bid received shall then be eligible for award of the contract.
- d. If the lowest bid is not a “local business” and a “local business” is within the percentage guidelines of the lowest bid received, the “local business”, subject to the provision of Subsection H below, shall be awarded the contract if it is willing to provide goods or services at the same price of the lowest bid received.
- e. If conditions of Subsections C above are met and the qualified “local business” declines or is unable to match the lowest bid, then the option to do so moves to the next qualified “local business”, if such business' bid is within the percentage guideline of the lowest bid, and is similarly responsible and responsive.
- f. In the event there is no “local business” eligible or willing to match the lowest bid, the lowest responsible and responsive bid submitted by an MBE, if any, would be allowed the opportunity to match the bid submitted by the non-local bidder and thereby be

awarded the contract when lowest bid is the primary determining factor in the bid selection process.

- g. If a procurement is to be made pursuant to state funding requirements, federal funding requirements, bond covenants, or other outside funding source requirements which prohibit or restrict local or MBE preference, then no local or MBE preference consideration will be given.
- h. The provisions for a local or MBE preference does not prohibit the right of the Williamsburg County School District to compare quality of materials proposed for purchase and compare qualifications, character, responsibility and fitness of all persons, firms, contractors, corporations, or other business entities submitting bids. Accordingly, the local or MBE preference for a particular procurement may be waived by the Williamsburg County School District upon written recommendation and justification by the Procurement Officer.

TECHNICAL SPECIFICATIONS FOR CIVIL SITE WORK

Kingstree Middle Magnet School Parking Lot Addition

KINGSTREE, SOUTH CAROLINA

EECO # 2018K04001



ERVIN ENGINEERING CO., INC.
ENGINEERS - SURVEYORS - PLANNERS

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GENERAL SITE WORK

SECTION 501

501.1 General

501.1.1 Site work shall be confined to the construction area as shown on the plans and shall be done in an approved manner with proper equipment. Excavation, filling, and grading work shall be suspended during rain and inclement weather or when unsatisfactory field conditions are encountered unless otherwise directed by the Engineer. At all times during construction, Contractor shall maintain proper drainage in the construction area.

501.2 Clearing and Grubbing

501.2.1 Where trees or brush exist at the site of the work, the construction area shall be cleared and stumps grubbed. Only those trees that seriously interfere with construction shall be cut and care shall be exercised to protect remaining trees and adjacent property. Brush shall be removed from the entire construction area and all stumps, logs, and brush resulting from this operation shall be completely burned or otherwise disposed of to the Engineer's satisfaction. Minor structures that may be on the site shall be removed and disposed of to the satisfaction of the Engineer.

(1) The operations of the Contractor shall be conducted with full consideration to all the proper and legal rights of the Owner and of adjacent property owners and the public and with the least possible amount of inconvenience to them.

(2) The Contractor shall consult with the Owner and Engineer prior to beginning clearing and a full understanding is to be reached as to procedure. The Contractor shall then conduct clearing and grubbing operations in strict accordance with these agreements.

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

501.3 Excavations and Grading

501.3.1 Dewatering equipment, when necessary, shall be installed prior to beginning excavation. The Contractor shall install a dewatering system capable of maintaining the ground water level of the entire area of construction two (2) feet below the deepest level of the proposed excavation. The dewatering system shall be maintained continuously 24 hours per day, seven days a week, for the entire period of construction and until backfilling is complete. Upon completion of backfilling, the ground water shall be allowed to slowly adjust to the normal level.

Should the dewatering system fail to maintain the water level as specified above, the Contractor shall employ a soil and foundation testing company selected by the Engineer to make the necessary investigation to determine the effect of the water or the safe bearing value of the soil and, if damaged, to recommend the necessary construction to restore the safe soil bearing value. The cost of employing the testing company and performing the construction recommended by them shall be borne by the Contractor.

The Contractor shall submit to the Engineer for approval, the method of dewatering along with a list of equipment and experience of the personnel performing this work.

TEMPORARY EROSION CONTROL GRASSING

SECTION 503

503.1 General

503.1.1 This work shall consist of seeding, fertilizing, liming when specified, mulching, and applying nitrogen when specified on all areas shown on the plans or where directed by the Engineer all in accordance with these specifications.

503.2 Materials

503.2.1 Seed. All seed shall conform to all State laws and to all requirements and regulations of the South Carolina Department of Agriculture.

The several varieties of seed shall be individually packaged or bagged, and tagged to show name of seed, net weight, origin, germination, lot number, and other information required by the Department of Agriculture.

The Engineer reserves the right to test, reject, or approve all seed before seeding.

Mixtures of different types of seed called for in the seeding schedule shall be weighted and mixed in the proper proportions at the site of the work in the presence of the Engineer.

Unless otherwise provided, the Contractor may select the type of seeding from the table shown below for the upper state and the lower state.

The total pounds of seed per acre shall be the sum total shown for all the varieties of seed opposite the schedule number in the seeding schedules below:

Seeding Schedules for Temporary Vegetation Upper and Lower State

Schedule No.	Common Name of Seed	Planting		Dates
		Rate	Rate	
1	Annual Sudan Grass (Sweet or Tift)	40		Apr. 1 –Aug.15
2	Brown Top Millet	50		Apr. 1 - Aug. 15
3	Rye Grain	55		Aug. 16-Mar. 31
	Annual Ryegrass	15		

503.2.2 Commercial Fertilizers. Commercial fertilizers shall comply with State fertilizer laws.

In a mixed fertilizer such as 4-12-12, the first number shall represent the minimum percent of nitrogen required, the second number shall represent the minimum percent of

available phosphoric acid required, and the third number shall represent the minimum percent of water-soluble potash required in the fertilizer.

503.2.3 Lime. Lime shall be agricultural grade, ground limestone and shall conform to the requirements of the S.C. Department of Agriculture.

503.2.4 Emulsified Asphalt SS-1. Emulsified Asphalt SS-1 shall meet the requirements of Subsection 406.06 of the SCDOT standard specifications.

503.2.5 Emulsified Asphalt RS-2. Emulsified Asphalt RS-2 shall meet the requirements of Subsection 406.06 of the SCDOT standard specifications. The RS-2 emulsion shall be diluted at the manufacturing plant with an equal amount of water. The resulting material shall be homogenous and satisfactory for spraying.

503.2.6 Straw Mulch. Straw mulch material shall consist of straw or hay. Straw shall be stalks of wheat, rye, barley, oats, or other approved straw. Hay shall consist of timothy, pea vine, alfalfa, coastal bermuda, or other grasses from approved sources. These materials shall be reasonably dry and shall be reasonably free from mature seed-bearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sandbur, Wild Garlic, Wild Onion, Wild Mustard, Crotonaria, Pigweed, Witch weed, and Cocklebur. The Contractor shall also comply with all State and Federal domestic plant quarantine regulations.

503.2.7 Excelsior Mulch. Excelsior mulch shall consist of wood fibers cut from sound, green timber. The average length of the fibers shall be 4 to 6 inches. The cut shall be made in such a manner as to provide maximum strength of fiber, but at a slight angle to the natural grain of the wood so as to cause splintering of the fibers when weathering in order to provide adherence to each other and to the soil.

503.2.8 Wood Cellulose Fiber Mulch. Wood cellulose fiber mulch shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form homogeneous slurry.

The mulch fibers shall intertwine physically to form a strong moisture-holding mat on the ground surface and allow rainfall to percolate the underlying soil. The mulch shall be heat processed so as to contain no germination or growth-inhibiting factors. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

Suppliers shall be prepared to certify that laboratory and field-testing of their product has been accomplished, and that it meets all of the foregoing requirements based upon such testing.

Weight specifications of this material from suppliers and for all applications shall refer only to air-dry weight of the fiber material. Absolute air-dry weight is based on the normal weight standard of the Technical Association of the Pulp and Paper Industry for wood cellulose and is considered equivalent to 10 per cent moisture. Each package of the cellulose fiber shall be marked by the manufacturer to show the air-dry weight content.

503.3 Installation

503.3.1 Stand of Grass. Before acceptance of the seeding performed for the establishment of permanent vegetation, the Contractor will be required to produce a satisfactory stand of perennial grass per SCDHEC standards whose root system shall be developed sufficiently to survive dry periods and the winter weather and be capable of reestablishment in the spring.

Before acceptance of the seeding performed for the establishment of temporary vegetation, the Contractor will be required to produce a stand of grass sufficient to control erosion for a given area and length of time before the next phase of construction or the establishment of permanent vegetation is to commence.

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

503.3.3 Preparation of Ground Before Seeding. The areas to be seeded shall be made smooth and uniform and shall conform to the finished grade and cross section shown on the plans or as otherwise designated. Minor shaping and smoothing of uneven and rough areas outside the graded section shall be performed as directed by the Engineer in order to provide for more effective erosion control and for ease of subsequent mowing operations.

The seedbed, if not loose, shall be loosened to a minimum depth of 3 inches before agricultural lime, fertilizer or seed is applied. The areas to be seeded shall be cleared of stones larger than 2-1/2 inches in any dimension, roots, and other debris.

503.3.4 Applying Lime and Fertilizer. Following advance preparation, and placing selected material for shoulders and slopes when called for in the contract -- lime if called for--and fertilizer shall be spread uniformly over the designated areas and shall be thoroughly mixed with the soil to a depth of approximately 2 inches. Fertilizer shall be applied at the rate of 500 pounds per acre for the initial application unless otherwise directed. Lime shall be applied at the rate specified in the proposal or as authorized by the Engineer. Unless otherwise provided, lime will not be applied for temporary seeding. In all cases where practicable, approved mechanical spreaders shall be used for spreading fertilizer and lime. On steep slopes subject to slides and inaccessible to power equipment, the slopes shall be adequately scarified. Fertilizer may be applied on steep slopes by hydraulic methods as a mixture of fertilizer and seed. When fertilizer is applied in combination seed and fertilizer drills, no further incorporation will be necessary. The fertilizer and seed shall be applied together when the method of seeding (Wood Cellulose Fiber Mulch) is used. Any stones larger than 2-1/2 inches in any dimension, larger clods, roots, or other debris brought to the surface shall be removed.

503.3.5 Seeding (Unmatched). Seed shall be sown within 24 hours following the application of fertilizer and lime and preparation of the seedbed as specified in Subsection 503.3.4. Seed shall be uniformly sown at the rate specified by the use of approved mechanical seed drills. Rotary hand seeders, power sprayers or other satisfactory equipment may be used on steep slopes or on other areas that are inaccessible to seed drills.

The seeds shall be covered and lightly compacted by means of a cultipacker or light roller if the drill does not perform this operation. On slopes inaccessible to compaction equipment, the seed shall be covered by dragging spiked chains, by light harrowing or by other satisfactory methods.

Within 24 hours following compaction of the seeded areas, Emulsified Asphalt RS-2, diluted at the manufacturing plant with an equal amount of water, shall be uniformly applied over the seeded areas at a rate of 0.15 to 0.32 gallon of the dilution per square yard. The exact amount shall be as fixed by the Engineer.

If permitted by the special provisions, wood cellulose fiber mulch or excelsior fiber mulch used and applied as specified for Methods B and C may be used and the 0.15 to 0.32 gallon of the diluted emulsion omitted.

503.3.6 Seeding (Mulched) Seeding (mulched) shall be performed as specified in Method B. Method B or C will not be permitted except when indicated in the special provisions.

Method A. Seeding (Straw or Hay Mulch). Seed shall be sown as specified in Paragraphs one and two of Subsection 503.3.5. Within 24 hours following covering of the seed, straw or hay mulch material shall be uniformly applied at the rate of 2 tons per acre. Mulch may be spread either by hand, by appropriate mechanical spreaders, or by blowers. The mulch shall allow sunlight to penetrate and air to circulate but also partially shade the ground and conserve soil moisture. The newly laid mulch shall be held in place as specified in (92); (1) shall not be used unless permitted in the special provisions.

(1) Emulsified Asphalt SS-1 shall be injected into the mulch as it leaves the power driven mulch spreader. The amount shall be approximately 150 gallons per ton of mulch material. The exact amount shall be as fixed by the Engineer and shall be the amount necessary to bond together the mulch particles without giving a heavy coating of the asphalt material and shall prevent wind erosion. Displaced mulch shall be replaced.

(2) Emulsified Asphalt RS-2 shall be diluted at the manufacturing plant with an equal amount of water and shall be uniformly applied over the mulch material as a film. The film shall be applied at approximately 0.20 gallon of dilution per square yard and shall be sufficient to bond together the mulch particles without giving a heavy coating of the asphalt material and shall prevent wind erosion. Displaced mulch shall be replaced.

Method B. Seeding (Wood Cellulose Fiber Mulch). After the lime has been applied and ground prepared as specified in Subsection 503.3.5, wood cellulose fiber mulch shall be applied at the rate of 1,500 pounds per acre in a mixture of seed and fertilizer. Hydraulic equipment shall be used for the application of fertilizer, seed, and slurry of the prepared wood pulp. This equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed, and water. The slurry distribution lines shall be large enough to prevent stoppage. The discharge

line shall be equipped with a set of hydraulic spray nozzles that will provide even distribution of the slurry on the various areas to be seeded. The slurry tank shall have a minimum capacity of 1,000 gallons.

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

Method C. Seeding (Excelsior Mulch). Seed shall be sown as specified in Paragraphs one and two of Subsection 503.3.5. Within 25 hours after the covering of seed, excelsior mulch shall be uniformly applied at the rate of 2 tons per acre. The mulch may be applied hydraulically or by other approved methods. Should the mulch be placed in a dry condition, it shall be thoroughly wetted immediately after placing. The Engineer may require light rolling of the mulch to form a tight mat.

503.3.7 Protection of Structures. Before spraying emulsified asphalt, the Contractor shall cover any parts of bridges, culverts, guardrail, signs, sidewalk, curb and gutter, catch basins, pipe ends and other structures as necessary to prevent discoloration.

503.3.8 Second Application of Fertilizer. After the plants have become established, fertilizer shall be applied on permanent vegetation uniformly in dry form at the rate of 500 pounds per acre on the areas designated by the Engineer. Fertilizer may, at the discretion of the Engineer, upon receipt of satisfactory evidence of its feasibility from the manufacturer, be applied in liquid form. Unless otherwise provided, temporary vegetation will not receive a second application of fertilizer. When two different types of fertilizer are set up in the proposal, the fertilizer with the less nitrogen content shall be applied to the areas where sericea lespedeza predominates.

503.3.9 Application of Nitrogen. As soon as the plants show satisfactory growth, actual nitrogen shall be applied evenly at the rate of 48 pounds per acre on the areas designated by the Engineer. Unless otherwise permitted, the nitrogen shall be applied in a solid form rather than in a liquid state. Nitrogen shall not be applied to stands of sericea lespedeza. Unless otherwise provided, nitrogen will not be applied to temporary vegetation.

503.3.10 Maintenance. The Contractor will be required to do all maintenance necessary to keep seeded areas in a satisfactory condition until the work is finally accepted. This includes mowing and repairing washes, and additional seed, fertilizer and mulch applied to areas where a satisfactory stand of grass has not been achieved.

**SECTION 503-A
PERMANENT TURF, GRASSES, AND SOD**

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Sprigging.
5. Erosion-control material(s).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

C. Certification of Sod: From sod vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage purity, germination, and weed seed. Include the grower name, year of production and date of packaging.

D. Qualification Data: For qualified landscape Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Land care Network or the American Nursery and Landscape Association.
 2. Experience: Three years' experience in turf installation.
 3. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
5. Pesticide Applicator: State licensed, commercial.
- B. Sod Producer: Company specializing in sod production and harvesting with a minimum 5 years' experience and certified by the State of South Carolina, Georgia or North Carolina.
- C. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- D. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. Six representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes (one per athletic field).
 3. Report suitability of tested soil for turf growth.
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable turf.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 "Project Meetings".

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.6 PROJECT CONDITIONS

A. Planting Restrictions: Coordinate installation of seed and sod during normal planting seasons for each type of plant material required.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.7 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until Final Completion of project.

1.8 WARRANTY

A. It is the responsibility of the Contractor to make known any site conditions which may be harmful or growth inhibiting to the plant materials specified, prior to acceptance or installation of said materials.

B. Special Warranty: Installer agrees to repair or replace turf and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner during 12-month warranty period, or incidents that

are beyond Contractor's control. Warranty shall cover any plant loss due to weather damage to plants installed out of normal planting season.

2. Warranty Periods from Date of Substantial Completion:
 - a. Seed, Hydroseed, and New Sod (provided in this contract): 12 months.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

1. Full Sun: Bermudagrass (*Cynodon dactylon*), unhulled.
2. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Bermudagrass (*Cynodon dactylon*), unhulled.
 - b. 50 percent perennial ryegrass (*Lolium perenne*).

2.2 TURFGRASS SOD

A. Turfgrass Sod: ASPA Certified, approve nursery grown grade; cultivated grass sod; minimum 18 months to replace damaged turf. Furnish viable sod of uniform density, color, and texture, with strong fibrous root system, free of stones, burned or bare spots, disease, nematodes, soil borne insects and containing no more than 5 weeds per 1000 sq. ft. Provide sod of uniform pad sized with maximum 5% deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected.

1. Tifway 419 Bermuda.

2.3 SPRIGS

A. Sod Sprigs: Healthy living stems, rhizomes, or stolons with a minimum of two nodes and attached roots free of soil, of the following turfgrass species:

1. Tifway 419 Bermuda.

2.4 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.

B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Aluminum Sulfate: Commercial grade, unadulterated.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.

G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.

I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.5 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.

1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.6 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.7 PLANTING SOILS

A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 4 > percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

2.8 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.9 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Invisible Structures, Inc.; Slopetame 2.
 - b. Presto Products Company, a business of Alcoa; Geoweb.
 - c. Tenax Corporation - USA; Tenweb.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.

B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply superphosphate fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
 - b. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.

3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.

4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.

2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 2 lb/1000 sq. ft.

- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 - 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal. /1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydro seed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
 - 3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.7 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade,

eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.
 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.8 SPRIGGING

A. Plant freshly shredded sod sprigs in furrows 1-1/2 to 2 inches deep. Place individual sprigs with roots and portions of stem in moistened soil, 12 inches apart in rows 18 inches apart, and fill furrows without covering growing tips. Lightly roll and firm soil around sprigs after planting.

3.9 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of

grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow bermudagrass to a height of 1/2 to 1 inch.
 2. Mow perennial ryegrass to a height of 1 to 2 inches.
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.10 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.11 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

EARTHWORK SECTION 504

Section 504.1 General

This specification is intended to be a part of the contract documents and to be included in the Contract Agreement as executed. It is intended to be a supplement to the approved Geotechnical Report for this project. Where there is a conflict between this specification and the geotechnical report, the geotechnical report will govern.

Section 504.2 Scope

This specification governs the technical requirements for earthwork and grading including clearing, grubbing, topsoil handling and stockpiling, handling of borrow and waste, temporary erosion and sediment control, and other necessary activities to grade the site to the lines, grades, and sections indicated on the design drawings.

Section 504.3 Related Work Specified Elsewhere

504.3.1 *Section 501 General Sitework, Section 503 Temporary Erosion Control, Section 880 Erosion Control, Section 881 Rip-Rap Blanket*

Section 504.4 Reference Codes, Specifications, and Standards

504.4.1 *Current editions or revisions of the following codes, specifications, and standards shall apply unless modified in this specification or on the design drawings:*

504.4.1.1 American Society for Testing and Materials—ASTM
Applicable Standards

ASTM D698 Standard method of test for moisture density relations of soils (Standard Proctor Method).

ASTM D1557 Standard method of test for moisture density relations of soils. (Modified Proctor Method).

ASTM D1556 Standard method of test for density of soil in place by the sand-cone method.

ASTM D2937 Standard method of test for density of soil in place by the drive cylinder method.

ASTM D2922 Standard method of test for density of soil in place by the nuclear method.

ASTM D3017 Standard method of test for moisture of soil in place by the nuclear method.

ASTM D2049 Standard method of test for relative density of cohesionless soils.

ASTM D2167 Standard method of test for density of soil in place by the rubber balloon method.

ASTM D2487 Classification of soils for engineering purposes.

504.4.1.2 International Building Code, 2006 Edition.

504.4.1.3 All applicable local, county, state, and federal codes and OSHA

Section 504.5 Clearing and Grubbing

504.5.1 *This section shall govern clearing and grubbing of land located within the limits shown on the plans, together with areas for borrow pits, disposal areas, and the areas of roads, parking areas, railroads, buildings, and structures.*

504.5.2 In excavation areas and fill areas, all trees, stumps, roots, stubs and brush more than two inches in diameter shall be cut off, excavated, and removed to a depth of not less than two feet below the ground surface and the entire area grubbed free from heavy vegetation, grass, roots, rubbish and refuse. In areas of clearing and grubbing where no further earthwork will occur, all excavations made for the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface of these sections conform to the surrounding surface. In fill areas, all soil disturbed as a result of clearing and grubbing operations shall be recompacted in accordance with the geotechnical report for this project.

504.5.3 Trees, bushes, shrubs or growth designated by the Owner to remain shall be protected and saved from harm during the progress of the

work. No trees, bushes, or shrubs outside the initial construction area shall be damaged in any manner.

504.5.4 All materials resulting from clearing and grubbing operations shall be removed from the site and legally disposed of at no additional cost. Upon completion of the operations, nothing shall remain within limits of the site which was deposited as a result of the clearing and grubbing operations.

Section 504.6 Topsoil

504.6.1 *Topsoil shall be excavated in cut and fill areas and stored for later use. The topsoil shall be excavated to the depths as directed, not less than four inches, and shall be quantified by the construction manager and transported and deposited by the contractor in offsite stock piles to be obtained and maintained by the contractor. These offsite stock pile areas must be accessible to the owner or owner's representative at all times. Topsoil shall be kept separated from other excavated materials, and shall be piled free of roots and other undesirable material.*

504.6.2 *Following finished grading operations, the graded areas which are not to be further improved or used for material storage, ponds, etc., shall be overlaid with topsoil of a compacted thickness of 4 inches minimum prior to grassing operations.*

504.6.2.1 The topsoil shall be obtained from stockpiles and placed on the areas at times when the subgrade is not muddy.

504.6.2.2 The spreading shall be uniform and once spread, the topsoil shall be compacted.

504.6.2.3 Prior to completion, the areas shall be dragged so that the surface is free of roots, sticks, and other vegetation remains.

Section 504.7 Materials

504.7.1 *Structural Fill (Borrow) The materials used for structural fill/borrow shall conform to the guidelines outlined in the approved Geotechnical Report for this project. All excavated materials that are to be used as structural fill are to be quantified by the construction manager and transported stockpiled by the contractor off site in locations obtained and maintained by the contractor. These offsite stock pile areas must be accessible to the owner or owner's representative at all times. The project Geotechnical Engineer shall approve all material to be used for structural fill/ borrow on this project.*

504.7.2 All other material requirements shall be as directed by the approved Geotechnical Report for this project.

504.7.3 Unsuitable Material

Unsuitable material is defined as material encountered in excavations or at the level of subgrade which does not meet the requirements of Section 504.8. This material shall be removed and disposed of and replaced with suitable structural fill to the extent recommended by the geotechnical consultant's field representative.

Section 504.8 Earthwork and Rough Grading

504.8.1 *This section shall govern the excavating for cut and the moving and placing of all fill materials necessary for grading of the general site, subgrades for roads, parking areas, buildings, and open ditches and is exclusive of the work necessary for construction of foundations for buildings, and other structures.*

504.8.2 *General*

504.8.2.1 High areas shall be cut to the grade shown. All suitable material removed from the excavations shall be used, insofar as practicable, in the formation of fills and slopes. All unsuitable material or surplus excavated material shall be quantified by the construction manager and wasted or stock piled offsite by the contractor in locations obtained and maintained by the contractor. These off site stock pile areas must be accessible to the owner or his representative at all times.

504.8.2.2 Roads, parking areas, and building areas shall be excavated or filled to subgrade elevations shown on the plans. Should ledge rock be encountered through cut sections, the rock shall be excavated to one foot below subgrade elevation and backfilled to the proper elevation as specified in Paragraph 504.8.3.

Section 504.8.3 Excavations

- 504.8.3.1 Cuts in earth occurring beneath roads and parking areas shall have a layer two feet in depth immediately below the subgrade compacted at plus or minus three percent of optimum moisture content to a density of not less than 98 percent of the maximum density as determined by ASTM D-698 or as specified on the construction plans or geotechnical report for this project.
- 504.8.3.2 Cuts in earth occurring beneath buildings shall have a layer one foot in depth immediately below the subgrade compacted at plus or minus three percent of optimum moisture content, to a density of not less than 98 percent of the maximum density as determined by ASTM D-698 or as specified on the construction plans or geotechnical report for this project.
- 504.8.3.3 Field density and moisture tests will be performed in accordance with ASTM D-1556, ASTM D-2167, ASTM D-2937, ASTM D-2922, ASTM D-3017, or ASTM D-2049.

Section 504.8.4 Embankments

Embankments shall be constructed of earth in compliance with the following subparagraphs:

- 504.8.4.1 After clearing and grubbing operations are complete, all fill areas shall be proof-rolled with heavily loaded pneumatic-tired equipment, such as 15- or 20-ton dump trucks or scrapers. Soil deflecting excessively under the moving load shall be undercut and replaced with compacted backfill. The upper 8-inch layer of material shall be compacted to a density not less than 98 percent of the maximum density as determined by ASTM D-698 or as specified on the construction plans or geotechnical report for this project.
- 504.8.4.2 Earth fills shall be constructed of approved earth or friable materials which shall be free of organic substances, spongy or frozen soil, and other objectionable substances which will prevent satisfactory consolidation. Earth or friable materials shall be deposited and spread in successive, uniform, approximately horizontal layers not to

exceed eight inches after compaction. Fill layers shall be constructed for the full width of the required cross section, and in such a manner that the embankment drains.

504.8.4.3 All fills occurring beneath buildings, roads, railroads, parking areas, and storage areas shall be compacted at plus or minus three percent of optimum moisture content to a density of not less than 98 percent of the maximum density as determined by ASTM D-698 or as specified on the construction plans or geotechnical report for this project.

504.8.4.4 (Other embankments such as pond dikes shall be filled as recommended in Geotechnical Report).

504.8.4.5 Field density tests will be performed in accordance with ASTM D1556, ASTM D-2167, ASTM D-2937, ASTM D-2922, ASTM D-3017, or ASTM D-2049.

Section 504.9 Finish Grading

All exposed earth surfaces shall be finish graded to within plus or minus 0.1 foot of theoretical grade. Roadways and parking subgrade shall be finished to within plus or minus 0.1 foot of theoretical grade. The degree of finish for grading slopes shall be that ordinarily obtainable from either blade-grader or scraper operations or by hand shovel operations. When so directed, the accuracy of finish obtained by the use of templates and stringline or hand-raking methods will be required in the case of shoulders, gutters, and similar areas. All gutters and ditches shall be finished so that they will drain readily.

Section 504.10 Maintenance and Erosion Control

504.10.1 The graded areas shall be maintained by using temporary erosion and sediment control measures during construction until final acceptance by the Owner, or until subsequent building construction or pavement construction has been performed.

504.10.2 The portions of the work which have been displaced due to acts of carelessness or negligence, including failure to properly route or contain surface water runoff, shall be repaired or reconstructed at no additional expense to the Owner.

504.10.3 The temporary erosion control measures shall be in conformance with local, state, or federal regulations to prevent erosion and subsequent sediment deposition into receiving streams during the construction period.

504.10.4 Erosion control and sediment containment measures designed to prevent concentration of runoff in erodible soil conditions, reduce velocity, or detain sediment loss shall be employed. These measures

may consist of but are not limited to temporary diversions, berms, slope drains, plow barriers, or silt fences.

Section 504.11 TESTING

- 504.11.1 *A qualified and experienced testing agency will be employed by the Owner to classify and identify soils, perform quality control testing for densities and moisture, and to perform other testing as directed by the Owner during construction.*
- 504.11.2 *Density and moisture quality control tests will be performed at the frequencies specified in the Geotechnical Report or as required by the Geotechnical Engineer retained by the owner.*
- 504.11.3 *The testing agency shall establish Atterburg limits and moisture-density relationships for every change in borrow or in place soil being compacted.*
- 504.11.4 *Soil shall be compacted to the degree of compaction specified within the moisture contents permitted in the approved Geotechnical Report for this project. Fill sections which are found to be deficient in compaction as a result of density testing shall be removed and replaced or reworked, according to the specification, and retested at no additional expense to the Owner.*
- 504.11.5 Proof Roll – Paved Areas and Walks: The contractor will be responsible for providing a loaded tandem axle dump truck with a minimum loaded weight of 75,000 pounds for proof rolling all sub-grade and base materials at areas to receive paving or walkways. All proof rolls shall be conducted under the observation of the special inspector/testing agency and a representative of the project Civil Engineer. The Contractor is responsible for providing four complete truck passes of the exposed areas with two of the passes being in a direction perpendicular to the preceding ones. The Contractor is responsible for undercutting and replacing any areas which deflect, rut, pump, or fail to tighten up after successive passes. Proofroll all subgrades and base materials after clearing and stripping of topsoil at areas to receive structural fill material or structures (paving, building slab, or sidewalk)

Section 504.12 INSPECTION

The Owner reserves the right to make inspections of the work of clearing and grubbing, grading, topsoil handling, and maintenance throughout the construction period to ensure that work is proceeding as specified on the design drawings and in this specification.

PAVING AND SURFACING

SECTION 508

508.1 General

501.1.1 Work on this project shall be done in accordance with Definitions and Requirements for Highway Construction of the South Carolina State Highway Department's Standard Specifications, 1973 Edition, exclusive of Section 100. Also excluded is any section that may be amended herein.

508.2 Preliminary Site Work

508.2.1 Preliminary site work shall be as specified in Section 501, General Site Work, of these specifications.

508.3 Crushed Stone Base

508.3.1 This item shall be constructed under Section 303.04 of the South Carolina State Highway Department's Standard Specifications, compacted and in place, to the depths shown on the plans. No paving will be allowed until the base course has been inspected by the Engineer as being complete, unyielding and compacted to the required thickness. Caution shall be exercised in the mixing and manipulating of the hauled in base to insure that the base does not include sub-grade materials. The Contractors shall provide blue tops for base completion. In addition to a proof roll per the plans witnessed by the Engineer, base thickness and compaction shall be checked every 300 feet minimum. Stone Base shall be compacted to 100% of Modified Proctor Maximum Dry Density as shown on the plans.

508.4 Binder Course

508.4.1 Binder course, where specified, shall comply with the South Carolina State Highway Department's Standard Specifications, Section 402. Binder course shall be Type 1 laid at the following rates as shown on the detail sheets:

Bus Loop & Heavy Dty Pvg 200 #/square yard for a minimum finished thickness of 2"
Where Shown on Plans

The binder course shall be compacted to 92.2 % of Modified Proctor as specified on the plan details. When used as a leveling course for uneven pavements, the 200#/square yard rate will be interpreted as an average. Where deemed necessary by the Engineer, approved automatic leveling devices shall be used with the paving machine. At least 15 days prior to the beginning of work, the contractor shall deliver a copy of the proposed job mix formula to the Engineer as required under Section 401.4 of the South Carolina State Highway Department's Standard Specifications. No samples of aggregates shall be submitted unless specifically requested in the Special Provisions or by the Engineer.

508.5 Sand Asphalt Leveling Course

508.5.1 Sand asphalt surface, where specified, shall comply with the South Carolina State Highway Department's Standard Specifications, Section 403, laid at a rate of 200#/square yard. When used as a leveling course for uneven pavements, the 200#/square yard rate will be interpreted as an average. Where deemed necessary by the Engineer, approved automatic leveling devices shall be used with the paving machine. At least 15 days prior to the beginning of work, the contractor shall deliver a copy of the proposed job mix formula to the Engineer as required under Section 401.4 of the South Carolina State Highway Department's Standard Specifications. No samples of aggregates shall be submitted unless specifically requested in the Special Provisions or by the Engineer.

508.6 Bituminous Surfacing

508.6.1 Bituminous surfacing shall be as specified in Section 403 of the South Carolina State Highway Department's Standard Specifications and laid at the type and rates given below:

Bus Loop (Heavy Duty)	Type C-M 200#/square yard for a minimum finished thickness of 2" compacted to 92.2% maximum specific gravity per details shown on plans.
Parent Drop Off (Light Duty)	Type C-M – 200#/square yard for a minimum finished thickness of 2" compacted to 92.2% maximum specific gravity per details shown on plans.

Where deemed necessary by the Engineer, approved automatic leveling devices shall be used with the paving machine. At least 15 days prior to the beginning of work, the contractor shall deliver a copy of the proposed job mix formula to the Engineer as required under Section 401.4 of the South Carolina State Highway Department's Standard Specifications. No samples of aggregates shall be submitted unless specifically requested in the Special Provisions or by the Engineer.

508.7 Patching

508.7.1 Patching for utility cuts shall be performed as detailed on the plans. Unless otherwise specified, asphalt shall be Type 2 as specified in the South Carolina State Highway Department's Standard Specifications, Section 403. All existing pavements shall be sawed or air hammer cut to the dimensions shown on the plans before patching is accomplished.

508.8 Field Laboratory

508.8.1 Unless specifically called for in the Bid Proposal and/or Special Provisions, the contractor will not be required to maintain a field laboratory as specified in the South Carolina State Highway Department's Standard Specifications, Section 401.12. The contractor will be expected, however, to assist with any sampling or testing to be accomplished by the Engineer.

SITWORK CONCRETE

SECTION 602

602.1 General

602.1.1 Concrete shall be placed to the lines and grades shown on the plans.

602.2 Materials

602.2.1 All poured in place concrete shall be plant mixed in accordance with ASTM C-94 unless otherwise approved in writing by the engineer. Cement shall be American Portland Cement, ASTM C-150 - Type 1. Air entraining concrete shall conform to ASTM C-175.

602.2.2 Fine and coarse aggregate shall be as shown in the approved design mix and shall be in full accordance with ASTM C-33.

602.2.3 Air entraining admixtures shall be as specified in ASTM C-260. Retarding admixtures shall comply with ASTM C-494 -Type D.

602.2.4 The following list of specifications are applicable to the concrete materials to be incorporated into the job.

ASTM Specification Number Title

C-31 Standard Method of Making and Curing Concrete Compression and Flexure Test Specimens in the field

C-39 Standard Method of Test for Compressive Strength of Molded Concrete Cylinders

C-42 Standard Methods of Securing, Preparing and Testing Specimens from Hardened Concrete for Compressive and Flexural strengths

C-192 Standard Method of Making and Concrete Compression and Flexure Test Specimens in the Laboratory

C-260 Specifications for Air Entraining Admixtures for Concrete

602.2.5 Reinforcing steel shall be grade 60, conforming to ASTM A615. All reinforcing steel shall be shop fabricated in accordance with approved shop drawings. Shop drawings in conformance with CRSI shall be submitted to the engineer for all reinforcing steel. Written approval shall be obtained from the Engineer before fabrication.

602.2.6 Accessories including chairs, supports, and ties shall adequately support the reinforcing and shall be placed in general conformance with CRSI Manual of Standard Practice for Reinforced Concrete Construction.

602.2.7 Mesh reinforcement shall have wire spacing and gage as noted on the plans and shall conform to ASTM 185.

602.2.8 Curing compound shall be non-staining type conforming to ASTM 309, applied in accordance with the manufacturers instructions. Curing compound will be delivered to job site in original containers with all application and technical information shown on the containers or in accompanying literature. Contractor shall obtain approval of all curing compound in writing by the engineer before use.

602.2.9 Water stops shall be of the type and size indicated on the plans. Where no size or type is given, PVC or 1/8 inch steel shall be used with a nominal height of 6".

602.2.10 Expansion, contraction, construction, and other joints shall be located as shown on the plans or as approved by the engineer. Materials and placement shall conform to ASTM D1751.

602.3 Construction

602.3.1 Forms shall be constructed straight and true to the lines and grades shown on the plans. The engineer shall approve all formwork before any concrete is placed. Approval will be for final configuration only, responsibility for structural integrity of the formwork shall remain with the contractor. Forms will be constructed to tolerances given in ACI 347.

602.3.2 All forms shall be adequately oiled with a non-staining form oil prior to concrete placement. All corners and edges shall have a 3/4-inch, 45-degree chamfer. Where soil conditions allow, undisturbed earth may be used for forming footing sides.

602.3.3 Form removal shall not commence until the contractor has determined that adequate strength has been developed to insure safety and prevent damage to the concrete. In general, stripping times shall be as follows:

Vertical form surfaces on walls
and columns -- 2 days (minimum)

Horizontal form surfaces on beams
and girders -- 6 days (minimum),
with structural support remaining
for 28 days

Supported slab surfaces -- Same as
horizontal surfaces above

602.3.4 Reinforcement shall be placed as shown on the approved shop drawings and construction plans. Placement tolerance shall be per ACI 318, with spacing or depth + or - 1/4 inch, and longitudinal location + or - 2 inch.

602.3.5 Reinforcement shall be protected during storage and in forms to prevent rust. No reinforcing will be allowed when, in the judgment of the engineer, excessive rust, mill scale, or dirt exists of the reinforcing bars.

602.3.6 Concrete shall not be placed until approval to do so is given by the engineer. Placement shall be as per ASTM 614. Concrete shall be mixed and transported in accordance with ASTM C-94. Concrete shall be placed in final position within 75 minutes after water or cement is first added to the mix. This time may be extended to a maximum of 2 hours where concrete with an approved water reducing retarder is used.

602.3.7 The contractor shall use conveyors, chutes, tremies, buckets, etc. for the efficient placement of the concrete but in no case will a placement system be allowed that causes undue segregation of aggregate. All concrete shall be consolidated by vibrating or rodding. The contractor will be responsible for having adequate back up vibrators, screeds, etc. to prevent interruption during a pour.

602.3.8 No concrete will be placed during periods of rain, sleet, or other precipitation.

602.3.9 No concrete shall be placed when the atmospheric temperature is below 35 degrees Fahrenheit or when the temperature threatens to drop below 25 degrees Fahrenheit within 48 hours, except upon written permission of the engineer, and such permission will not be granted until satisfactory provisions have been made to protect the work. Should the temperature drop below 30 degrees Fahrenheit while concrete is being placed or before it has hardened sufficiently to prevent injury from cold, the contractor shall provide sufficient housing and heating apparatus to enclose and protect the structure in such a way that the air surrounding the fresh concrete can be kept at a temperature above 50 degrees Fahrenheit for a period of 3 days after the concrete is placed.

602.3.10 During hot weather adequate means shall be taken to protect fresh concrete from heating to temperatures exceeding 90 degrees Fahrenheit.

602.3.11 All freshly poured concrete surfaces shall be kept moist for minimum of four days to allow for thorough curing. An acceptable curing compound may be used in lieu of wet curing with the engineer's approval. Any concrete to accept paint or coatings shall not be cured with curing compound.

602.3.12 An ordinary surface finish shall be given to all concrete. As soon as the concrete has set the required time, the forms shall be removed carefully, the fins removed, and all depressions resulting from the removal of metal ties, and all other holes and rough places carefully pointed with a mortar of sand and cement. The surface of all such pointed surfaces shall be made flush with the adjacent surface by means of a wooden float before setting occurs.

602.3.13 A rubbed finish shall be given all surfaces except those designated to receive an ordinary surface finish only. As soon as the ordinary surface finish has set sufficiently to permit, the entire surface shall be thoroughly wet with a brush and rubbed with a No. 16 carborundum stone or an abrasive of equal quality, bringing the surface to a paste. The rubbing shall be continued sufficiently to remove all form marks and projections, producing a smooth, dense surface without pits or irregularities. The material, which, in the above process, is ground to a paste, shall be carefully spread or brushed uniformly over the entire surface and allowed to take a reset. The above-described procedure is called the "first rub." Immediately after the first rub is completed, the surface shall be covered and kept covered for at least 2 days, or until the curing is complete.

The "second rub" to produce the final finish shall be thoroughly wet with a brush and rubbed with a No. 30 carborundum stone or an abrasive of equal quality. This rubbing shall continue until the entire surface is of a smooth texture and uniform in color. The surface shall then be striped evenly with a brush so as to remove excess paste, and the surface left smooth and with only enough paste to obtain the desired color.

Any part of the structure, which is disfigured by the drip from the rubbing, shall be thoroughly cleaned.

602.3.14 If approved by the Engineer, a brushed-on surface finish may be applied to all concrete surfaces required to receive the "rubbed" finish, using one brushed-on coat where a one-rub finish is specified, and two brushed-on coats where a two-rub finish is specified. The brushed-on surface finish shall be in lieu of the specified rubbed finish. The same type finish, either the brushed-on or the rubbed finish, shall be used throughout the structure.

The material used for the brushed-on finish shall be predominately of Portland cement, with special additives, and shall meet the requirements of Federal Specification TT-P-0035. The material shall be especially manufactured for the purpose of waterproofing exterior concrete surfaces, and also for the purpose of enhancing the appearance of the concrete surface. The final color of the applied finish shall be pearl gray, or near that of good quality cured natural concrete. The proposed material for the brushed-on finish must meet the approval of the Engineer prior to its application.

All surfaces to receive the brushed-on surface finish shall first be given the ordinary surface finish as required in Subsection 602.3.12. The brushed-on finish shall not be used to cover up defects in the concrete surface. All necessary repair work must be done prior to the application of the surface finish. Membrane curing compound shall not be used on surfaces to be finished. The brushed-on finish shall be applied strictly in accordance with the written recommendations of the product manufacturer. Workmen who have been instructed in the preparation and application of the material shall do the actual application of the material. The final brushing of the material shall be done in such manner as to present a uniform and attractive appearance, with the final brushing generally being done in one direction.

602.4 Testing

602.4.15 Mix design information shall be submitted to the engineer for approval. No concrete will be poured without an approved design mix developed in accordance with ACI 318.

602.4.16 Field-testing of concrete will be done by a laboratory approved by the Engineer. The contractor will be responsible for sampling, making, and curing test cylinders for each pour. He will also be responsible for timely delivery of cured cylinders to the approved laboratory.

Each strength test shall consist of 4 cylinders; two tested at age 7 days and two at 28 days. Before any concrete is placed on the job, a strength test shall be made using the proposed design mix as directed by the engineer and make additional tests until it is established that design mix will produce required strength. For each class of concrete, make one strength test for each pour of 100 cubic yards, but not less than one test for each day's concreting. Specimens shall be secured in accordance with ASTM C172, made and cured in accordance with ASTM C-31, and tested in accordance with ASTM C-39. During concreting, additional cylinders may be required for field curing in order to justify removal of formwork. One slump test shall be made for each strength test in accordance with ASTM C-143.

SECTION 604

CONCRETE SIDEWALKS

604.1 General

The work covered under this section of these specifications shall be for the construction of concrete sidewalks as detailed on the plans in accordance with SCDOT Standard Specifications, latest edition, or as specified otherwise herein.

604.2 Concrete Sidewalks

All walks under this section will be governed by Section 720 of SCDOT Standard Specifications for Highway Construction, 1986, latest edition, in its entirety and as detailed in the plans. If not indicated on the drawings, construction joints to be placed ten (10') on centers and expansion joint every thirty (30') feet in the sidewalks. Reinforcement shall be 6x6 WWF. Where sidewalk is 5' wide contractor shall install a control joint every 5' or as specifically indicated on the Architectural Plans. Where sidewalks are shown to be utilized as curbs also, the curb edge shall be constructed as shown on the detail sheet.

EROSION CONTROL

SECTION 880

880.1 General

880.1.1 Erosion control shall be performed as given on the Erosion Control Plan. Indicated features are to be provided in accordance with standards given below. Special features or construction will be detailed on the Plan Sheet. The Engineer before project construction shall approve all deviations from the Erosion Control Plan.

880.2 Temporary Construction Entrance

880.2.1 Definition - A stone stabilized pad located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area.

880.2.2 Design Criteria - Coarse aggregate up to approximately 3 inches in diameter should be used. Pad thickness shall be 6-inches minimum with a pad width of not less than full width at all points of vehicular ingress or egress. Pad length shall be not less than 50 feet. Wheels must be cleaned to remove mud prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with crushed stone, which drains into an approved sediment trap or sediment basin. Entrance shall be located or protected so as to prevent sediment from leaving the site.

880.2.3 Maintenance - The entrance shall be maintained in a condition that will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 2-inch stone, as conditions demand, and repair and/or clean out of any structures used to trap sediment. All materials spilled, dropped, washed, or tracked from vehicle onto site, onto roadway, or into storm drain should be removed immediately.

880.3 Temporary Perimeter Dike

880.3.1 Definition - A ridge of compacted soil, with a life expectancy usually of one year or less, constructed along the perimeter of the disturbed area.

880.3.2 Standards - Drainage areas of not more than 5 acres. Top width of 2-foot minimum with a height (compacted fill): 18-inch minimum unless otherwise noted on the plans. (Height measured from the natural ground at the upslope toe to top of the dike.) Side slopes 2:1 or flatter. The grade is dependent upon topography, but must have positive drainage to the outlet. Where slope of channel behind dike is less than 2%, stabilization may not be required; where 2% or more, stabilization will be required.

880.3.3 Outlet - Diverted runoff must be discharged directly into a sediment trapping facility such as a sediment basin, sediment trap, or gravel outlet structure.

880.3.4 Construction Specifications - (a) All dikes must be machine compacted. (b) All perimeter dikes must have positive grade draining to a sediment trapping facility. (c) Frequent inspection and required maintenance must be provided. (d) Dikes must be located far enough away from the disturbed area to permit machine regrading and clean-out. (e) Diversion dikes must be seeded and/or mulched immediately following construction.

880.4 Temporary Diversion Dike

880.4.1 Definition - A ridge of compacted soil with a general life expectancy of one year or less, constructed immediately above cut, or fill slopes, or other site feature needing protection from runoff water.

880.4.2 Criteria - A drainage area of no more than 5 acres. A top width of 2-feet minimum with a height (compacted fill): 18-inch minimum (height measured from the natural ground at the up-slope toe to the top of the dike.) The side slopes shall be 2:1 or flatter with a grade dependent upon topography, but must have positive drainage to the outlet. Where slope of channel behind dike is less than 2%, stabilization may not be required; where the slope is 2% or greater, stabilization shall be required.

880.4.3 Outlet - Diverted runoff must outlet directly onto an on-site, undisturbed, stabilized area, a level spreader, or into a grade stabilization structure or sediment basin.

880.4.4 Construction Specifications - (a) All dikes must be machine compacted. (b) All diversion dikes must have positive grade to an outlet. (c) Diverted runoff must outlet directly onto an on-site, undisturbed stabilized area, a level spreader, into a grade stabilization structure, or a sediment basin. (d) Frequent inspection and required maintenance must be provided. (e) Dikes must be located far enough away from the construction area to permit machine regrading and clean-out. (f) Diversion dikes must be seeded and/or mulched immediately after construction.

880.5 Temporary Interceptor Dike

880.5.1 Definition - A ridge of compacted soil or gravel, constructed across a disturbed right-of-way and similar sloping areas, usually to remain for a period of less than one year.

880.5.2 Criteria - A top width of 2-feet minimum with a height of 18-inches minimum unless otherwise noted on the plans (height measured from the upslope toe to top of the dike.) Side slopes of 2:1 or flatter (flat enough to allow construction traffic to cross if desired) and with a grade of 0.5% to 1.5%. Spacing distance between dikes: maximum slope of right-of-way above dike: 60 feet, 10%; 100 feet, 5-10%; 150 feet, 5%.

880.5.3 Outlet - Interceptor dikes must have an outlet that functions with a minimum of erosion. The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

880.5.4 Construction Specifications - (a) All earthen dikes must be machine compacted. (b) All interceptor dikes must have positive grade to an outlet. (c) Top width may be wider and side slopes may be flatter if desired. (d) Field location should be adjusted as needed to utilize a stabilized safe outlet. (e) Diverted runoff must outlet directly onto an undisturbed stabilized area, a level spreader, or into a grade stabilization structure. (f) Frequent inspection and required maintenance must be provided.

880.6 Temporary Level Spreader

880.6.1 Definition - An outlet constructed at zero grade across the slope whereby concentrated runoff may be discharged at non-erosive velocities onto undisturbed areas stabilized by existing vegetation.

880.6.2 Design Criteria - A specific design for level spreaders will not be required; however, spreader length will be determined by estimating Q10 flow and selecting the appropriate length from the table below.

880.6.4 Outlet - Final discharge will be over the level lip onto an undisturbed stabilized area.

880.6.5 Construction Specifications - (a) Construct level lip on zero percent grade to insure uniform spreading of storm runoff (converting channel flow to sheet flow). (b) Level spreaders must be constructed on undisturbed soil -- NOT ON FILL. (c) Entrance to spreader must be graded in a manner to insure that runoff enters directly into the zero percent graded channel. (d) Storm runoff converted to sheet flow must outlet onto undisturbed stabilized areas. (e) Periodic inspection and maintenance must be provided to insure intended purpose is accomplished. (f) Frequent clean-out of the level spreader, being careful not to disturb the vegetation below the level lip, may be necessary to prevent blockage by silt.

PLAN VIEW

Designed Q (CFS)	Minimum Length ("L" in Ft.)
Up to 10	15
10 to 20	20
20 to 30	26
30 to 40	36
40 to 50	44

880.7 Temporary Gravel Outlet Structure

880.7.1 Definition - An auxiliary structure installed in conjunction with, and as a part of a diversion, interceptor, or perimeter dike, or other structure designed to temporarily detain sediment-laden surface runoff.

880.7.2 Design Criteria - The minimum capacity shall be that required to pass the peak flow expected from a ten-year frequency storm without causing damage to the dike. Minimum length in feet, of the gravel outlet structure, shall be equal to six times the number of acres of contributing drainage area. The invert of the gravel outlet shall not be less than 6 inches lower than the minimum elevation of the top of the dike. Use 1 to 3 inch well-graded gravel.

880.7.3 Outlet - Gravel outlet will be discharged onto an already stabilized area or into a stable watercourse.

880.7.4 Maintenance - The gravel outlet structure shall be inspected after each runoff-producing rain. The gravel must be replaced when the structure ceases to function as intended due to silt accumulation among the gravel.

880.7.5 Construction Specifications - (a) The bases and side slopes of the gravel will be placed so as to conform to the dike configuration. (b) The invert of the gravel outlet shall be not less than 6 inches lower than the top of the adjoining earth dike. (c) The gravel shall extend to the top of the dike.

880.8 Temporary Pipe Drop

880.8.1 Definition - A temporary pipe installed down a bank slope to convey storm runoff from the top to the bottom of the bank slope.

880.8.2 Design Criteria - The minimum design capacity for the temporary pipes shall be the peak runoff from a 5-year, 24-hour frequency storm. Additional capacity shall be provided in the form of freeboard, emergency spillway, or other means to prevent overtopping of the dike protecting the pipe during its expected life. Runoff calculations shall be based on an acceptable and currently used method of computing runoff. The minimum pipe diameter shall be 8 inches.

880.8.3 Inlet and Outlet - A standard flared end section or equivalent shall be used on the inlet end to decrease head losses and on the outlet end to spread out the concentrated flow.

880.8.4 Maintenance - Frequent inspection will be required to avoid clogging of the inlet from debris or vegetation.

880.8.5 Vegetative Stabilization - The disturbed area shall be vegetated in accordance with the standard "Planting for Erosion Control."

880.8.6 Construction Specifications - (a) The structure shall be placed in undisturbed soil or well-compacted fill. (b) The cut or fill slope shall not be steeper than 1 vertical to 2.0 horizontal (2.0:1) and should not be flatter than 20:1. (c) The pipe shall be imbedded in the embankment to a depth that will insure stability. (d) Protective measures of concrete or rip-rap shall be installed at the outlet as needed to protect against erosion. (e) The pipe shall be of smooth or corrugated metal of the required strength and durability. (f) Backfill shall be placed in

layers and tamped to insure adequate compaction. (g) Fabricated bends in the pipe may be necessary for installation on steep slopes.

880.9 Temporary Straw (or Hay) Bale Barrier

880.9.1 Definition - A barrier installed to intercept and detain sediment.

880.9.2 Criteria - Bales must be securely tied and staked in place.

880.9.3 Construction Specifications - (a) Bales will be placed in a single row, lengthwise, on the contour, and embedded in the soil to a depth of 3 inches. (b) Bales must be securely anchored in place by stakes or rebars driven through the bales or by other acceptable means to prevent displacement. (c) Inspection must be frequent and repair or replacement must be made promptly as needed.

880.10 Temporary Sediment Trap

880.10.1 Definition - An impounding area formed by excavation or barrier to trap sediment being transported by storm runoff from a disturbed area of very limited size.

880.10.2 Design Criteria - The trap shall be sized to provide a minimum storage capacity of 67 cubic yards per acre of contributing drainage area. It should be dimensioned to fit the site conditions and located so as to not interfere with construction operations and to facilitate periodic clean out. Traps shall be not less than 1 foot or more than 2 feet deep measured from the invert of the outlet. The minimum length of flow through the trap shall be 10 feet. Side slopes shall not be steeper than 1:1. Sediment traps must be self-draining unless they are otherwise protected in an approved fashion so as not to present a safety hazard.

880.10.3 Construction Specifications - (a) Sediment traps may be constructed on a natural ground surface, on an excavated surface, or on machine compacted fill provided they have a non-erodible outlet. (b) They must be checked after each runoff producing rain and repaired or cleaned as necessary to insure that they will operate as intended.

880.11 Debris (or Sediment) Basin

880.11.1 Definition - A barrier or dam constructed across a waterway or at other suitable location to form a silt or sediment basin.

880.11.2 Scope - This section covers the installation of debris basins in sites where: (1) Failure to the structure would not result in loss of life, damage to buildings, highways, railroads, or interruption of use or service of public utilities; (2) Height of embankment does not exceed 20 feet; (3) The drainage area does not exceed 200 acres.

880.11.3 Design Criteria - Compliance with Laws and Regulations: Design and construction shall comply with all state and local laws, ordinances, rules and regulations.

880.11.4 Sediment Storage Capacity - The sediment storage capacity of a debris basin shall equal or exceed the volume of sediment to be trapped in the basin during its planned, useful life. The minimum capacity provided should be: Developed areas or well-vegetated areas -- .01-acre foot, per acre, per year. In Construction areas or critically eroding areas -- .06-acre foot per year.

If temporary vegetation is to be established immediately after rough grading, the minimum required storage from construction areas might be reduced by 25 percent.

The storage basin shall be cleaned out whenever its functioning is impaired due to insufficient capacity. Debris basins planned to be converted to ponds after the area above is stabilized must be designed for at least a 6-foot depth of water at the dam in addition to the minimum required sediment storage. Also, a drain must be provided whereby the basin can be drained and the collected sediment removed or spread out if necessary to make an acceptable pond.

880.11.5 Principal Spillways - A pipe spillway is required on all basins. The pipe spillway shall consist of a vertical pipe riser or box riser joined to a conduit that will extend through the embankment and outlet below the downstream toe of the fill.

The pipe spillway shall be proportioned to convey not less than 0.2 CFS per acre of drainage area without causing flow through the emergency spillway. The minimum size pipe shall be 4 inches in diameter. The vertical pipe riser or box riser shall have a cross-sectional area at least 1.5 times that of the pipe.

One anti-seep collar shall be installed around the pipe when any of the following conditions exist: (1) The settled height of the dam exceeds 15 feet. (2) The conduit is of smooth pipe larger than 8 inches in diameter. (3) The conduit is of corrugated metal pipe larger than 12 inches in diameter.

The anti-seep collars and their connection to the pipe shall be water-tight. Protection against scour at the discharge end of the spillway shall be provided.

Trash racks shall be installed where needed.

880.11.6 Earth Emergency Spillways - All debris basins shall have an earth emergency spillway unless the peak flow from the design storm is carried through a pipe spillway or other mechanical spillway. The earth spillway shall be excavated in undisturbed earth or compacted fill. The minimum bottom width shall be 8 feet. The spillway shall be designed to be stable for the design flow.

Peak discharges for design of the emergency spillway shall be computed using an accepted method and shall be based on the soil and anticipated cover conditions in the drainage area during the expected life of the structure.

The crest of the emergency spillway shall be at least 0.5 feet above the crest of the principal spillway.

For debris basins with 20 acres or less watershed, the combined capacities of pipe and emergency spillways shall be sufficient to convey the peak discharge from the 10-year, 24-hour frequency storm. For debris basins with watersheds greater than 20 acres, the combined capacity

of pipe and emergency spillway shall be adequate to convey the peak discharge from the 25-year, 24-hour storm.

The top of a dam for all debris basins shall be at least 0.5 feet higher than the stage reached by the design storm.

The crest elevation of the emergency spillway will be determined by the head required on the principal spillway but shall be at least 0.5 feet above the crest of the principal spillway.

880.11.7 Embankment (Earth Fill) - The minimum top width shall be 10 feet. Side slopes shall be at least 2-1/2:1.

880.11.8 Construction Specifications - Site Preparation-- Areas under the embankment and any structural works shall be cleared and grubbed; all vegetation and objectionable material shall be removed.

880.11.9 Clearing - All debris basins designed for permanent water shall be cleared. All sediment basins designed for periodic clean-out will be cleared of stumps.

880.11.10 Compaction of Embankment - The material placed in the fill shall be free of all sod, roots, frozen soil, stones over six (6) inches in diameter and other objectionable material. The placing and spreading of fill material shall be started at the lowest point of the foundation and the fill shall be brought up in approximately horizontal layers of such thickness that the required compaction can be obtained with the equipment used. The construction equipment shall be operated over the area of each layer in such a way that will result in the required compaction. Special equipment shall be used when the required compaction cannot be obtained without it.

The distribution and gradation of materials throughout the fill shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. Where it is necessary to use materials of varying texture and gradation, the more impervious material shall be placed in the upstream and center portions of the fill.

The moisture content of the fill material shall be such that the required degree of compaction can be obtained with the equipment used.

880.11.11 Cut-off Trench - A cut-off trench shall be excavated along the dam centerline on earth fill embankments. The minimum depth shall be 2 feet. The cut-off trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be 4 feet but wide enough to permit operation of compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for embankment. The trench shall be drained during the backfilling compaction operations.

880.11.12 Emergency Spillways - Earth spillways shall be constructed in undisturbed earth unless otherwise specified and approved.

880.11.13 Vegetation Protection - The exposed earthen areas resulting from construction or otherwise existing will be stabilized by seeding, sodding, fertilizing and/or mulching as soon after construction as practical and shall conform to the standard "Planting for Erosion Control."

The embankment and spillway shall be fenced where necessary to protect the vegetation.

880.11.14 Final Disposal - After temporary structures have served their intended purpose and the drainage area above is properly stabilized, the embankment and resulting silt deposits are to be otherwise disposed of in accordance with an agreed to plan. Denuded areas will be re-vegetated.

880.12 Land Grading

880.12.1 Definition - Reshaping the ground surface to planned grades as determined by engineering survey and layout.

880.12.2 Design Criteria - The grading plan and installation shall be based upon adequate surveys and investigations. The plan must show the location, slopes, cuts, fills, and finished elevations of the surface to be graded. The plan shall include all practices necessary for controlling erosion on the site and decreasing siltation downstream. Such practices may include, but are not limited to debris basins, diversion, mulching, temporary or permanent vegetation, retention walls, lined ditches, vegetated waterways, grade stabilization structures, and surface and subsurface drains. The practices may be temporary or permanent depending upon their need after construction is completed. The grading plan shall include the following as a minimum:

(1) The finished cut and fill slopes that are to be vegetated with grasses and legumes shall not be steeper than 2 horizontal to 1 vertical. Slopes to be maintained by tractor or other equipment should not be steeper than 3 horizontal to 1 vertical. The finished grade of cut and fill slopes that are to be vegetated with vines shall not be steeper than 1 horizontal to 1 vertical.

(2) Cut or fills shall not be so close to property lines as to endanger adjoining property without adequately protecting such properties against erosion, sedimentation, slippage, settlement, subsidence, or other related damages.

(3) Structural and/or vegetative practices shall safely conduct surface water to storm drains or adequate watercourses.

(4) Subsurface drainage shall be provided in areas having a high water table to intercept seepage that would affect slope stability, bearing strength, or create undesirable wetness.

(5) No fill is to be placed where it will slide or wash up on the premises of others.

(6) Fill will not be placed adjacent to a channel bank where it will create bank failure and reduce the capacity of the stream, or result in deposition of sediment downstream.

(7) All borrow and disposal areas shall be included as part of the grading plan.

(8) Adequate channels and floodways shall be provided to safely convey the increased runoff from the developed area to an adequate outlet without causing significant channel aggradation, degradation, or increased off site flooding or erosion.

880.13 Diversion

880.13.1 Definition - An earthen channel, with a supporting ridge on the lower side, constructed across the slope.

880.13.2 Classification of Diversions

Temporary - Temporary diversions are usually installed to protect some phase of construction or the establishment of vegetation. They normally can be removed after the construction they are protecting is complete or after vegetation on the protected area is established (usually two years or less).

Permanent - Permanent diversions are installed as an integral part of an overall water disposal system. They are designed and maintained as an important part of the system.

880.13.3 Design Criteria (Location) - The general location of the diversion will be determined by its purpose. Outlet conditions, topography, land use, soil type, and length of slopes must be considered in arriving at the final location.

On construction sites, the diversions should be located to avoid interference with construction equipment, permanent fixtures, and features of the development.

880.13.4 Capacity - Peak runoff values used to determine the capacity requirements of diversion shall be computed using an accepted method. The minimum storm frequency values to be used for design of diversions are outlined in the following table:

MINIMUM DESIGN FREQUENCIES FOR DIVERSIONS

Diversion	Design Storm* Minimum Frequency	
	Typical Area of Protection	24-Hour
Temporary	Construction areas and areas to be vegetated	2 Years
Permanent	Agricultural land and pollution abatement systems	10 Years
	Low value buildings for storage, livestock, etc. and recreation areas	10 Years
	Homes, schools, industrial buildings and other high value buildings	50 Years

 *In all cases, the design storm frequency shall be selected to provide protection consistent with hazard or damage that would occur if the diversion should overtop.

Where it is not possible to provide adequate sediment control measures for a temporary diversion, the channel capacity must be increased to provide for the expected sediment accumulation.

880.13.5 Velocity - Permissible design velocities depend primarily on soil and vegetation. Consideration must be given to the type and growth characteristics of the planned vegetation. This will determine the degree of retardance to be used in designing for capacity. Stability of the diversion must be determined for the vegetation during its establishment period when its retardance to flow is least effective. Permissible design velocities shall be determined from the table on the following page.

880.13.6 Cross-Section - (Permanent Diversion): The channel shall be designed to have stable side slopes. The side slopes for permanent diversion channels should not be steeper than 3:1. The back slopes of the embankment shall not be steeper than 2:1. The constructed ridge height shall include at least 0.3 feet freeboard and a reasonable settlement factor must be provided. The minimum top width of the diversion ridge after settlement shall not be less than four (4) feet. All disturbed and denuded areas will be vegetated, sodded, mulched, or otherwise protected.

880.13.7 Cross-Section - (Temporary Diversion): In determining the cross section of temporary diversions, consideration shall be given to soil type, outlet conditions, and machinery working over and around the area. Settlement and top width should be the same as permanent diversions.

880.13.8 Protection Against Erosion and Sedimentation and Vegetative Establishment

Temporary Diversion - When the expected use exceeds three (3) months, temporary vegetation shall be established and maintained until the life of the diversion is terminated. Where temporary vegetation is not practical, mechanical protection such as stone centers or mulching shall be provided.

Permanent Diversions - A filter strip of permanent vegetation thirty feet wide, measured from uphill wetted perimeter of the diversion, will be used.

Permanent vegetation will be established and maintained on the ridge and channel of the diversion, and shall conform to the standard for "Planting for Erosion Control."

Eroding and sediment producing areas in the drainage area above the proposed diversion should be stabilized prior to, or concurrent with the construction of the diversion.

880.13.9 Outlets - Diversions will be designed to have adequate outlets that will convey runoff without causing erosion of the diversion or to adjacent areas.

The designed elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

880.13.10 Construction Specifications:

(a) All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the diversion.

(b) The diversion shall be excavated or shaped to line, grade, and cross section as required to meet the criteria specified here, free of irregularities that will impede normal flow.

(c) Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the complete diversion.

(d) All earth removed and not needed in construction shall be spread or disposed of so that it will not interfere with the functioning of the diversion.

880.14 Grassed Waterway or Outlet

880.14.1 Definition - A natural or constructed open channel established to safely convey surface runoff.

880.14.2 Design Criteria (Capacity) - The minimum capacity shall be that required to convey the peak runoff from a 10-year, 24-hour frequency storm. Any acceptable method may be used to compute the peak runoff.

Consideration must be given to the type and growth characteristics of the planned vegetation. Adequate capacity must be provided in the waterway to convey the peak flow during the most dense growth of the planned vegetation.

880.14.3 Velocity - Design velocities should be based upon the erodibility of the soil, duration of flow, and types and quality of vegetation. The table on the following page provides the maximum permissible velocities for different soils and vegetation. However, design velocities should NOT exceed 4.0 feet per second unless the vegetation is already established or will be established by sodding.

880.14.4 Outlets - Outlets of grassed waterways must have adequate capacity to convey the designed quantity of water from the waterway without causing damage to downstream areas. The following types of outlets are acceptable:

- (1) Natural or constructed vegetated outlets capable of withstanding the design discharge.
- (2) Paved or concrete lined channels.
- (3) Streams, provided outfall structures are installed where needed to prevent erosion.

880.14.5 Depth - The minimum depth of a waterway or outlet receiving water from diversions or other tributary channels shall be that depth required to keep the design water surface elevation in the waterway or outlet at or below the design water surface elevation in the diversion or other tributary channels at their junction when both are flowing at design capacity.

880.14.6 Drainage - Drain pipes or other suitable drainage measures shall be provided for in the design for sites having low flow, high water table, or seepage problems except where water tolerant vegetation can be used.

880.14.7 Vegetative Stabilization - Permanent vegetation of constructed waterways will be established in accordance with the applicable standard "Planting for Erosion Control" or "Sodding".

880.14.8 Construction Specifications -

(a) All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the waterway.

(b) The diversion shall be excavated or shaped to line, grade, and cross section as required to meet the criteria specified here, free of irregularities that will impede normal flow.

(c) Fills shall be compacted as needed to prevent unequal settlement that would cause damage in the complete waterway.

(d) All earth removed and not needed in construction shall be spread or disposed of so that it will not interfere with the functioning of the waterway.

880.15 Lined Waterway or Outlet

880.15.1 Definition - A waterway or outlet with an erosion resistant lining of concrete, stone, or other permanent material. The line section extends up the side slopes to designed depth. The earth above the permanent lining may be vegetated or otherwise protected.

880.15.2 Scope - This standard applies to waterways or outlets with linings of non-reinforced, cast in place concrete; flagstone mortared in place; rock riprap or similar permanent linings. It does not apply to irrigation ditch and canal lining, grassed waterways with stone centers, or small, lined sections to carry prolonged low flows. The maximum capacity of the waterway flowing at designed depth shall not exceed 100 cfs.

880.15.3 Design Criteria (Capacity) - The minimum capacity shall be adequate to carry the peak rate of runoff from a 10-year frequency storm. Capacity shall be computed using Manning's formula with a coefficient of roughness "n" as follows:

Concrete:

Trowel finish	- .012-. 014
Float finish	- .013-. 017
Gunite	- .016-. 022
Flagstone	- .020-.025
Riprap	- .04d ⁵⁰ 1/6 where "d" is in feet

For design of riprap, see National Cooperative Highway Research Program Report 108. "Tentative Design Procedure for Riprap - Lined Channels", or other accepted procedures.

880.15.4 Velocity - Maximum design velocity shall be as shown below. Except for shot transition sections, flow in the range of 0.7 to 1.3 of the critical slope must be avoided unless the channel is straight. Velocities exceeding critical will be restricted to straight reaches.

<u>Design Flow Depth</u>	<u>Maximum Velocity</u>
0 - .5'	25 fps
.5 - 1.0'	15 fps
1.0'	10 fps

Waterways or outlets with velocities exceeding critical shall discharge into an energy dissipater to reduce velocity to less than critical.

880.15.5 Cross_Section - the cross-section shall be triangular, parabolic, or trapezoidal. Monolithic concrete may be rectangular.

880.15.6 Freeboard - The minimum freeboard for lined waterways or outlets shall be 0.25' above design high water in areas where erosion resistant vegetation cannot be grown adjacent to the paved side slopes. No freeboard is required where good vegetation can be grown and is maintained.

880.15.7 Side Slope - Steeped permissible side slopes, horizontal to vertical will be as follows:

Non-reinforced concrete
Hand-placed, formed concrete:
Height of lining 1.5 ft. or less - vertical
Hand-placed, screeded concrete or mortared
in-place flagstone:
Height of lining less than 2 ft. - 1 to 1
Height of lining more than 2 ft. - 2 to 1
Slip form concrete
Height of lining less than 3 ft. - 1 to 1
Rock Riprap - 2 to 1

880.15.8 Lining Thickness - Minimum-lining thickness shall be as follows:

Concrete - 4 inches
Rock riprap - maximum stone size plus thickness of
filter or bedding
Flagstone - 4 inches, including mortar bed

880.15.9 Related Structures - Side inlets, drop structures, and energy dissipaters shall meet the hydraulic and structural requirements for the site.

880.15.10 Filters or Bedding - Filters or bedding to prevent piping, reduce uplift pressure, and collect water will be used as required and will be designed in accordance with accepted engineering principles. Weep holes and drains will be provided as needed.

880.15.11 Concrete - Concrete used for lining shall be so proportioned that it is plastic enough for thorough consolidation and stiff enough to stay in place on side slopes. A dense, durable product will be required. A mix that can be certified as suitable to produce a minimum strength of at least 3,000 pounds per square inch shall be used. Cement used shall be portland cement, Type I or II. Aggregate used shall have a maximum size of 1-1/2 inches.

880.15.12 Mortar - Mortar used for mortared in-place flagstone shall consist of a workable mix of cement, sand, and water with a water, cement ratio of not more than 6 gallons of water per bag of cement.

880.15.13 **Contraction Joints** - Contraction Joints in concrete linings, where required, shall be formed transversely to a depth of about one-third the thickness of the lining at a uniform spacing in the range of 10 to 15 feet.

880.15.14 **Rock Riprap of Flagstone** - Stone used for riprap shall be dense and hard enough to withstand exposure to air, water, freezing, and thawing. Flagstone shall be flat for ease of placement and have the strength to resist exposure and breaking.

880.15.15 **Vegetative Establishment** - All disturbed areas shall be vegetated in accordance with the standard "Planting for Erosion Control."

880.15.16 **Construction Specifications** - (a) The foundation shall be cleared of trees, stumps, roots, sod, loose rock, or other material. (b) The cross-section shall be excavated to the neat lines and grades as shown on the plans. Over-excavated areas shall be backfilled with moist soil compacted to the density of the surrounding material. (c) No abrupt deviations from design, grade, or horizontal alignment shall be permitted.

(d) Concrete linings shall be placed to the thickness shown on the plans and finished in a workmanlike manner. Adequate precautions shall be taken to protect freshly placed concrete from extremely hot temperature and to insure proper curing. (e) Filter, bedding, and rock riprap shall be placed to line and grade and in the manner specified. (f) Construction operations shall be done in such a manner that erosion, air, and water pollution will be minimized and held within reasonable and legal limits. The complete job shall be workmanlike and present a good appearance.

880.16 **Topsoiling**

880.16.1 **Definition** - The addition of topsoil to a site to be planted to grasses, legumes, shrubs, or trees.

880.16.2 **Specifications**

Topsoil Quality - (a) Topsoil may be any texture except sand, sandy clay, clay loam, silty clay, or clay. (b) The material shall be friable and free of tree roots, noxious weeds, and stones more than 1-1/2 inches in diameter or length, and of other debris. (c) Soil treated with an herbicide will not be used for topsoiling if it is determined that the herbicide will be damaging to desirable vegetation.

Sources of Topsoil - (a) Material for topsoiling shall be taken from the natural surface layers (a horizon) of soils known to be capable of producing good yields of cultivated crops or hay. (b) Topsoil may be stripped from and stockpiled at a site for later replacement. Stockpiled topsoil will not be compacted. (c) Areas from which topsoil has been removed shall be protected against erosion.

Applying Topsoil - (a) Topsoil will not be collected or spread while it is wet. (b) Subsurface will be scarified or otherwise tilled to facilitate bonding prior to spreading topsoil. (c) Topsoil will be uniformly spread to a minimum settled depth of three inches and will be spread to conform with designed finish grades.

Cubic Yards of Topsoil Required to Cover

Depth (inches)	1,000 Square Feet	One Acre
1	3	134
2	6	269
3	9	403
4	12	538
5	15	672
6	18	806

1 Cubic Yard - 27 Cubic Feet - 46,656 Cubic Inches
 1,000 Square Feet, 1 Inch Deep - 144,000 Cubic Inches - 3.08 Cubic Yards
 1 Acre (43,560 Square Feet), 1 Inch Deep - 6,272,000 Cubic Inches = 134.43 Cubic Yards

880.17 Planting for Erosion Control

880.17.1 Definition - Planting vegetation, either permanent or temporary, on areas subject to erosion.

880.17.2 Specifications - (Site Preparation): (a) Grading, shaping and other earth moving will be completed to the extent necessary to permit seedings or plantings, either temporary or permanent. The finished grade of slopes with a slope length of more than four (4) feet that are to be planted and maintained in grasses and/or legumes shall be no steeper than 2:1. (Slope lengths steeper than 2:1 and less than four (4) feet long may be seeded.) Similar slopes to be maintained in vines shall be no steeper than 1:1. (b) Concentration of water that will cause excessive erosion while vegetation is being established will be diverted to a safe outlet. Structures used to divert water or provide additional protection to an area may be either permanent or temporary according to the needs of the site; however such structures must conform to the appropriate standards and specifications. (c) Stones, stumps, and trash that will interfere with seedbed preparation, plantings, or the planned use and maintenance of the area will be removed.

880.17.3 Providing for Short-Term Cover (Mulching) - Mulch alone may be used to provide short-term protection against erosion. Mulches will be applied and anchored in accord with the provisions of the standard and specification for "Mulching".

Planting for Short Term Cover (Seedbed Preparation) - (a) Tillage shall be the minimum needed to break compaction, incorporate fertilizers when incorporation of them is required, and provide enough loose soil to cover the seed when the seed is to be drilled or covered by harrowing. Tillage may be incidental to grading or shaping and may be excluded on newly graded areas that will be seeded before a crust can form. (b) Tillage may be by any suitable implement. (c) Tillage will be on the contour or across the slope where it is feasible.

Plant Selection - (a) Refer to Table 1 for species, planting rates, and planting dates. (b) Select the species that are best adapted to the site and to the needs and desires of the land user.

Seeding - (a) Seed may be placed by the most convenient available method. Regardless of the method used, the seed must be distributed uniformly.

Lime and Fertilizers - (a) Lime will not be required for short-term seedings unless a soil test shows the pH to be below 4.5 or unless it is desirable to apply lime for the benefit of a long-term planting which will follow the short-term seeding. When lime is applied, it will be uniformly spread and incorporated into the soil. (b) A minimum of 500 pounds per acre (11.5 pounds per 1,000 square feet) of 10-10-10 fertilizer, or the equivalent, will be uniformly applied at planting time unless a soil test indicates the need for a different rate or analysis of fertilizer. Additional nitrogen applied later as a top-dressing, may be required for some seeding.

880.17.4 Planting for Long-Term Cover - (Preparing the Soil for planting) - (a) Preparation shall consist of the least tillage necessary to break compaction, incorporate lime and fertilizers where incorporation of them is required, and allow the proper placement of seed, sprigs, or plants. Preparation may be incidental to grading and shaping and may be eliminated when: (1) Earthwork has been recently completed and the area will be seeded to grasses or legumes before a crust can form. (2) Grasses or legumes are to be planted directly into the stubble of a temporary cover crop or on top of a mulch. (b) Tillage may be by any suitable implement. (c) Tillage will be on the contour or across the slope where it is feasible. (d) Site preparation by furrowing, discing, scalping, or bedding will be required where trees or shrubs are to be planted in a heavy vegetative cover. Grass and legumes will be planted between rows of trees or shrubs on bare or sparsely vegetated areas.

Plant Selection - (a) Refer to Tables 2 and 3 for plants, planting rates, and planting dates. (b) Plants shall be selected on the basis of species characteristics, site and soil conditions, the planned use and maintenance of the area, the time of year the planting is to be made, and the needs and desires of the land user. (c) Seeding mixtures intended to provide long-term, low maintenance cover for critical areas will ordinarily include a perennial legume and one or more perennial grasses. For sod specifications, refer to the standard and specifications for "Sodding". (d) Seeding mixtures may include nurse crops of a small grain or a grass for quick cover (such as rye or brown top millet); however, the rate of the nurse crop in a mixture shall be no greater than 25% of the rate usually used when it is seeded alone. (e) The planting rates listed in Table 2 may be adjusted to meet special conditions and to accord with local experience; however, the approximate ratios of species in mixtures indicated in Table 2 will be maintained.

Seeding and Planting - (a) Grasses and legumes shall be planted uniformly. Drilling, broadcasting, or hydroseeding methods may be used. Seed planted by broadcasting shall be lightly covered by rolling or harrowing in all areas accessible to implements. Seeds of legumes intended to provide long-term cover inoculated with an inoculant appropriate for the species immediately prior to planting. (b) Trees, shrubs, and vines may be planted with appropriate planters, seeders, or hand tools. Each plant will be set in a manner that will avoid crowding the roots, and soil shall be firmed about the roots. Seedlings shall be planted at a depth nearly equal to or slightly deeper than the depth at which they were originally growing.

Lime and Fertilizer - (a) Unless a soil test indicates different requirements, lime and fertilizers will be applied at rates that equal or exceed those shown below when planting grasses and legumes. (1) Agricultural limestone: 1-1/2 tons per acre (70 pounds per 1,000 square feet), or the equivalent. (2) Fertilizers as one of the following: 1,000 pounds per acre (23 pounds per 1,000 square feet) of 10-10-10 fertilizer, or the equivalent at planting time, or 1,000 pounds of 5-10-10 fertilizer per acre (23 pounds per 1,000 square feet) at planting time plus a top dressing of fertilizer at a later date. The top-dressing shall include a minimum of 50 pounds per acre (1.1 pounds per 1,000 square feet) of available nitrogen where grasses are to be encouraged and a minimum of 40 pounds per acre (0.9 pounds per 1,000 square feet), each, of P₂O₅ and K₂O where legumes are to be encouraged. (b) No lime and/or fertilizer will be applied without a soil test when planting trees or shrubs.

Mulching - (a) Mulch is used to provide necessary additional protection against erosion and/or to aid in the establishment of plant cover. Refer to the standard and specification for materials, rates, and methods of anchoring mulches. (b) Steep slopes will be mulched as soon as possible after planting, but in no case will mulching be delayed more than forty-eight (48) hours after planting. (c) Seedings made so late in the fall or winter that germination cannot be expected until spring (dormant seedings) will be mulched. (d) Appropriate mulch materials may be applied simultaneously with seed and fertilizer when they are applied by a hydroseeder.

880.17.5 Hydraulic Seeding Methods (Hydroseeding) - (a) Lime, fertilizers, seeds, and appropriate mulch materials may be applied simultaneously in a mixture of these materials and water by a hydroseeder. The water and materials mixture (slurry) will be uniformly applied at a rate that will not cause erosion. (b) Legumes will be treated with four times the manufacturer's recommended rate of inoculant when they are planted by a hydroseeder.

880.17.6 Management of Plantings to Secure Cover - (a) Planted areas shall be protected from damage by fire, grazing, weed competition, and traffic. (b) Additional fertilizer shall be applied as needed, to obtain vigorous growth and desirable density and composition of vegetation.

880.18 **Mulching**

880.18.1 Definition - Applying plant residues or other suitable materials not produced on the site to the soil surface.

880.18.2 Specifications (Site Preparation) - Construction work and/or plantings shall be completed according to appropriate specifications or plans prior to applying a mulch.

880.18.3 Mulching Materials - (a) The mulch materials that best meet the needs of the site and the desires of the land users shall be selected from the list which follows. All materials shall be uniformly distributed at the rate indicated.

(1) Small Grain Straw and Hay - Apply 1-1/2 to 2 tons per acre of 70 to 90 pounds per 1,000 square feet. The material must be dry and free of coarse stems, mold damage, and noxious weeds. It will be anchored where there is danger of it being blown or washed away.

(2) Pine Straw - Apply one-half inch deep on area plantings or from four to six inches deep around individual trees, shrubs, or vines. Needles from long-leaved species of pines will be used.

(3) Sericea Seed-Laden Hay - Apply at rates of two to four tons per acre or 90 to 180 pounds per 1,000 square feet as needed to cover the ground 100%. The sericea shall be cut when about 75% of the seeds are brown and shall be taken from fields that reasonably could be expected to produce at least 300 pounds of hulled seed per acre.

(4) Juts Fiber Matting (Soil Antiwash, Erosinet, or the equivalent) - Matting shall be placed in contact with the soil loosely but smoothly. When used in areas of concentrated flows, matting shall be installed in accord with the provisions of Figure 1. Staples used to anchor matting shall be six inches in length, one inch wide at the crown and made from No. 11 (0.120 inch diameter) wire. One-half of the seed to be sown on matted areas shall be sown before the matting is placed. Adjacent strips of matting shall be overlapped approximately two inches and the overlap stapled in the same manner as an edge.

(5) Barnyard Manure - Apply at the rate of eight tons per acre or 70 to 90 pounds per 1,000 square feet. Manure with a high straw content will be used. Barnyard manure will not be used to mulch frozen soil when its odor will be objectionable, or where surface waters will be contaminated.

(6) Wood Cellulose Fiber - Apply at a minimum rate of 1,000 pounds per acre or 25 pounds per 1,000 square feet with a hydro-seeder. The use of this material is limited to flatter slopes and to optimum seeding dates.

(7) Wood Chips - Apply in layers two to six inches deep or 460 to 920 pounds per 1,000 square feet. The application of wood chips is limited to flatter slopes and is prohibited in areas subject to a concentrated flow of water.

(8) Liquid Asphalt (Cutback Asphalt) - Spray 1,250 gallons per acre or 28.7 gallons per 1,000 square feet of the slow curing (SC) type. (Caution: This material sheds water and may inhibit the growth of seeds planted on dry soils).

(9) Burlap, Tobacco Cloth, and other Cloths - Materials will be spread loosely but smoothly over the area to be protected and anchored to prevent washing or blowing away.

(10) Other Materials - Mulch materials other than those listed above, may be used provided they: (a) fulfill the purposes listed in the standard and, (b) are applied according to the manufacturer's specifications or current USDA, or Clemson University publications.

880.18.4 Mulch Anchoring Materials and Methods - (a) The material or method best suited to the mulching material used, the site, and the desires of the land user will be selected from the list below.

(1) Punching into the Soil - Ends of fibers will be pushed into the soil approximately three inches by passing over them with a special implement built for the purpose, or a farm disc set straight, or by the use of a shovel in small areas.

(2) Asphalts - (a) Liquid asphalt of the rapid (RC) or medium (MC) curing types will be sprayed on hay or straw mulched areas at the minimum rate of 300 gallons per acre or 6.9 gallons per 1,000 square feet. (b) Asphalt emulsions; types SS-1, MS-2, RS-1, or RS-2 may be either injected into hay or straw mulch as it is blown on or sprayed on top of the mulch after it is spread. When the asphalt emulsion is blown on with the mulch, the rate of application will be a minimum of 250 gallons per acre (3.4 gallons per 1,000 square feet), and when it is sprayed on

the mulch the rate will be 300 gallons per acre (6.9 gallons per 1,000 square feet). No asphalt emulsions that have been allowed to freeze will be used, and the material will be kept between 75 and 160 degrees F while it is being applied.

(3) Paper Twine Fabric, Mulch Netting and Other Net Materials These materials shall be installed in accordance with the provisions of Figure 2. Staples used to anchor nettings shall be six inches in length, one inch wide at the top, and made from No. 11 (0.120 inch diameter) wire. Rolls of netting may be installed with the length either up and down the slope or across it.

(4) Pegs and Twine - This method will be used on hay or straw and other long-fiber mulches only. Pegs 8" to 20" long will be set on intervals of approximately 3 feet by 3 feet and driven within 3" of the soil surface. Twine will then be used to form a net between pegs. The twine will be looped around each peg twice and the slack pulled out between pegs. After the net is woven, the pegs will be driven in until their tops are flush with the soil's surface.

(5) Rye or Millet Seed - Rye or millet seed may be added to appropriate seeding mixtures for the purpose of anchoring mulches. Rates will not exceed 20 pounds of brown top millet or 15 pounds of rye per acre.

(6) Other Mulch Anchoring Materials and Methods - Materials and methods for anchoring mulches other than those listed above may be used provided: (a) They adequately protect the mulch against wind or water erosion. (b) They are practical and feasible. (c) They are acceptable to the landowner or user.

880.19 Sodding

880.19.1 Definition - Planting sod of adapted perennial grasses.

880.19.2 Specifications - Site Preparation - (a) All grading, shaping, and other earth moving shall conform to appropriate plans or specifications prior to placing sod. (b) All rocks, roots, waste materials, and other trash that will interfere with placing or maintaining sod or the planned use of the area will be removed. (c) Topsoil, when it is used, shall be uniformly spread to a minimum settled depth of three inches.

880.19.3 Tillage - (a) Sites to be sodded shall be tilled to the minimum extent necessary to break compaction or surface seals, incorporate lime and fertilizer, and provide enough loose soil for fine finish grading where a lawn-like turf is to be established.

(b) Tillage may be by any suitable implement or combination of implements and will be on the contour or across the slope where it is feasible. (c) Final tillage operations shall leave the soil smooth and firm. Areas to be established in lawn-like turf shall be rolled prior to placing sod. Any depressions revealed that will cause water to stand shall be filled, and any mound that will cause scalping when the grass is mowed shall be leveled.

880.19.4 Sod Quality - (a) Sod intended primarily for erosion control or where aesthetic values are of minor importance may be taken from fields that have dense, vigorous standards of desirable species relatively free of weeds. (b) Sod to be used where aesthetic values are important will be taken from sod nurseries where the turf is known to be true to type and of uniform, high quality. (c) Sod may be cut into uniform blocks or strips of any convenient dimensions to facilitate handling; however, the edges must be cut straight and smooth. The thickness of each piece (combined soil and root depth and exclusive of crowns, stems, and

leaves) shall be no more than one (1) inch. (d) Sod that has become heated or dried will not be used. (e) No area stripped of sod will be left without adequate protection against erosion.

880.19.5 Lime and Fertilizer - (a) The required amounts of lime and fertilizer will be incorporated into the soil. Incorporation may be incidental to tillage. (b) Unless a soil test indicates different needs, the following minimum amounts of lime and fertilizer will be applied: Lime - One ton per acre or 46 pounds per 1,000 square feet. Fertilizer - One thousand pounds per acre or 23 pounds per 1000 square feet of 10-10-10 fertilizer or the equivalent.

880.19.6 Placing Sod - (a) Dry soils will be watered prior to placing sods. (b) Placement will begin at the lower end of slopes and channels with the longest axis of the sod pieces aligned across the slope or channel. Joints between pieces will be staggered between rows, and each piece will be placed as snugly as possible against the adjacent one. Any small gaps or voids remaining after the sod pieces are laid will be filled with topsoil. (c) Outer border pieces or strips of sod placed in channels will be set low enough that water entering the channel from the side will flow over them. (d) Newly placed sod in danger of slipping on steep slopes before the new root system can develop will be anchored with wooden pegs or wire staples. (e) Freshly placed sod in areas planned for high intensity use will be rolled or tamped where it is feasible, then watered until the water penetrates the soil beneath the sod.

880.19.7 Time of Sodding - Sodding may be done any time during the growing season, but must be completed at least four weeks before the end of the growing season or before the newly sodded area is used intensively.

880.20 Open Channel

880.20.1 Definition - Constructing or improving a channel, either natural or artificial, in which water flows with a free surface.

880.21.2 Design_Criteria - Location - The alignment of channels shall not be changed to the extent that the stability of the channel or laterals thereto is endangered.

880.21.3 Channel Capacity - The capacity for open channels shall be determined by procedures applicable to the purposes to be served, and in accordance with sound engineering principles.

The water surface profile or hydraulic grade line for design flow shall be kept below bank level for all significant areas. The "n" value for aged channels, assuming the expected maintenance, shall be used in this computation. The required capacity shall be based on peak flows for the design storm consistent with the purpose of the channel, desired level of protection, and economic feasibility.

In urban or urbanizing areas, a channel with its associated floodway should be designed to convey the 100-year storm without permitting floodwater to damage homes, buildings, or other valuable property.

880.21.4 Hydraulic Requirements - Manning's formula shall be used to determine the velocities in the channels. The "n" values for use in this formula, when designing channels to be constructed or modified, shall be estimated using sound engineering references.

880.21.5 Channel Cross Section - The required channel cross section and grade are determined by the design capacity, the materials in which the channel is to be constructed, and the requirements for maintenance. A minimum depth may be required to provide adequate outlets for subsurface drains, tributary ditches or streams. Developments through which the channel is to be constructed must be considered in design of the channel section. Safety considerations are important in the selection of the cross section in urban areas.

880.21.6 Channel Stability - Characteristics of a stable channel are: (a) It neither aggrades or degrades beyond tolerable limits. (b) The channel banks do not erode to the extent that the channel cross-section is changed appreciably. (c) Excessive sediment bars do not develop. (d) Excessive erosion does not occur around culverts and bridges or elsewhere. (e) Gullies do not form or enlarge due to the entry of uncontrolled surface flow to the channel.

All channel construction and modification shall be in accordance with a design that can be expected to result in a stable channel that can be maintained at reasonable cost.

Channel stability shall be determined for an aged condition, and the velocity shall be based on the design flow or the bank full flow, whichever is greater, using an "n" value based on the expected kind and density of vegetation and assuming good maintenance. The discharge used in stability analyses of channels having a controlled inflow shall be their design flow.

Channels also must be stable under conditions existing immediately after construction. For this stability analysis, the velocity shall be calculated for the expected flow from a ten-year frequency storm on the watershed, or the bank full flow, whichever is smaller, and the "n" value for the newly constructed channel shall be used. The "n" values of newly constructed channels in fine-grained soils and sands generally should not exceed 0.025.

880.21.7 Travel ways for Maintenance - Travel ways for maintenance shall be provided as a part of all channel modification. A travel way shall be provided on each side of large channels if necessary for use of maintenance equipment. Travel ways must be adequate for movement and operation of equipment required for maintenance of the channel.

880.21.8 Appurtenant Structures - The design of channels should provide for all structures required for the proper functioning of the channel and the laterals thereto and travel ways for operation and maintenance. Recessed inlets and structures, needed for entry of surface and subsurface flow into channels to prevent significant erosion or degradation, shall be included in the design of the channel. If the proposed channel bottom elevation is below the elevation of the bottom of a lateral channel at their junction to the extent that a recessed inlet is not feasible, the lateral channel must be stabilized by a sound structure.

The effect of channel modifications on existing culverts, bridges, buried cables, pipelines, and other fixed improvements shall be evaluated to determine the need for modification or replacement.

Culverts and bridges which are modified or added as part of channel improvement projects shall meet reasonable standards for the type of structure and shall have a minimum capacity equal to the design discharge. When the design discharge is based on storms which occur frequently, i.e., storms of one or two-year frequency, it may be desirable to increase the capacity of the culverts and bridges above the design discharge. When a county, city, state, or

federal highway is involved, the responsible agency will determine the capacity of the bridge or culvert required.

880.21.9 Disposition of Spoil - Spoil material resulting from clearing, grubbing, and channel excavation shall be disposed of in a manner which will: (a) Minimize over bank wash, (b) Provide for the free flow of water between the channel and flood plain unless the valley routing and water surface profile are based on continuous dikes being installed, (c) Not hinder the development of travel ways for maintenance, (d) Leave the right of way in the best condition feasible, consistent with the project purposes, for productive use by the owner, and (e) Improve the aesthetic appearance of the site to the extent feasible.

880.21.10 Vegetative Establishment - Vegetation shall be established on all bare areas including the channel banks in accordance with the standard "Planting for Erosion Control".

880.21.11 Construction Specifications - Specifications for open channels shall be in keeping with this standard and shall be prepared for each job depending upon its location and intended purpose.

880.22 Clearing and Snagging

880.22.1 Definition - Removing snags, drifts, or other obstructions within a channel.

880.22.2 Design Criteria - The channel capacities, both before and after improvement, shall be determined by using the Manning equation, using applicable value of the retrace factor, "n", or both conditions. The value of "n" used to determine channel capacity after improvement shall reflect the degree of maintenance expected in future years.

The area to be cleared and snagged shall include the perimeter of the channel, the flow area of the floodway, or both. Adjacent trees or other objects that may fall into the channel shall also be included. Clearing and snagging may also be specified for other areas, including berms, for use as temporary disposal areas, for travel ways, or for planned conservation uses.

880.22.3 Channel Stability - The stability of the channel shall not be impaired due to the clearing and snagging. Instability resulting from this practice shall be corrected.

880.22.4 Vegetative Stability - Disposal areas or any denuded areas resulting from the clearing and snagging operations should be vegetated in accordance with the standard "Planting for Erosion Control."

880.22.5 Construction Specifications - All trees, stumps, and brush within the perimeter of the channel shall be cut as close to ground level as the cutting tools will permit. Where other areas are to be cleared, the trees, brush, and other woody vegetation shall be cut within the maximum distance above ground level required by the planned use of the areas and/or as specified in the project plan.

Trees shall be felled in such a manner as to avoid damage to other trees, property, and objects located outside the limits of clearing.

Down trees, logs, drifts, boulders, debris, and other obstructions, lying wholly or partially within the channel, shall be removed. Piling, piers, headwalls and sediment bars that obstruct the free flow of water will be removed when so designated in the plans.

The use of explosives in any and all clearing and snagging operations shall strictly comply with applicable state statutes and regulations.

Trees, logs and all combustible material resulting from the clearing and snagging operations shall be burned, buried, piled in a designated disposal area, or otherwise disposed of as specified for the project. The residue from burning and noncombustible material will be buried outside the channel or placed in designated disposal areas. All buried material will be covered with earth to permit the planned land use.

880.23 Grade Stabilization Structure

880.23.1 Definition - A structure to stabilize grade or to control head cutting in natural or artificial channels. (This standard applied to all types of grade control structures. It does not apply to storm sewers or their component parts.)

880.23.2 Design Criteria - Compliance with Laws and Regulations - Design and construction shall be in compliance with state and local laws and regulations.

880.23.3 General - Designs and specifications shall be prepared for each structure by an engineer or on an individual job basis, depending on its intended purpose, site conditions, and the basic criteria of the conservation practice with which the structure is planned. The following items contain information on some typical structures:

(1) Channel linings of concrete, asphalt, half-round metal pipe, gabions, or other suitable lining materials. These linings should generally be used where channel velocities exceed safe velocities for vegetated channels or where durability of vegetative lining is adversely affected by seasonal changes. Adequate protection will be provided to prevent erosion or scour of both ends of the channel lining.

(2) Outfall structures of concrete, rock riprap, or other suitable material used to lower water from one elevation to another. These structures are applicable where it is desirable to drop the watercourse elevation over a very short horizontal distance. Adequate protection will be provided to prevent erosion or scour upstream, downstream and along sides of outfall structures.

(3) Pipe drops of metal pipe with suitable inlet and outlet structures. The inlet structure may consist of a vertical section of pipe or similar material, a standard flared end section, an embankment or a combination of these. The outlet structure will provide adequate protection against erosion or scour at the pipe outlet.

880.23.4 Capacity - Structures that are designed to operate in conjunction with other erosion control practices shall have a minimum capacity sufficient to handle the bank full capacity of the channel or pipe delivering water to the structures.

Peak runoff values, used to determine the capacity requirements of grade control structures, shall be computed using an accepted method.

Structures will involve the retarding of floodwater, or the impoundment of water shall be designed using storm frequency to provide protection consistent with the hazard or damage that would occur if structures should overtop or break.

Island type structures shall be proportioned to discharge a capacity equal to the downstream channel capacity at bank full stage.

880.23.5 Design Velocities - Design velocities shall be determined using Manning's formula or other appropriate and accepted procedures. The design velocities computations will be based upon a roughness coefficient "n" commensurate with the type of channel lining used. Design velocities will be in the safe range for the type of channel linings used and will be based on the design peak flow. Values of "n" to be used for different type linings are given below:

Values of "n" to be used with Manning's Formula*

Surface	Best	Good
Cast Iron Pipe	.011	.012
Wrought Iron Pipe (Galvanized)	.013	.014
Riveted and Spiral Steel Pipe	.013	.015

Values of "n" to be used with Manning's Formula*

Surface	Best	Good
Vitrified Sewer Pipe	.010	.013
Clay Drain Tile	.011	.012
Brick in Cement Mortar	.012	.013
Concrete Pipe	.012	.013
Concrete Lined Channels	.012	.014
Semi-Circular Metal Flumes, Smooth	.011	.012
Semi-Circular Metal Flumes, Corrugated	.0225	.025

*From King's Handbook of Hydraulics

880.23.6 Foundation Investigations - Foundation investigations shall be made at each site. Sufficient soil borings shall be made at the structure site to determine suitability of the site for the proposed structure.

The foundation material shall (1) have required supporting strength, (2) be resistant to sliding and to piping, and (3) possess uniform consolidation characteristics.

880.23.7 Vegetative Stabilization - Dikes, embankments, diversions, or other earthwork including borrow areas or other disturbed areas, shall be properly vegetated in accordance with the standard "Planting for Erosion Control" and/or other applicable standards.

880.23.8 Construction Specifications - The quality, proportioning, strength, and placement of the specified construction materials shall be in accordance with the engineer's design.

880.24 Stream bank Protection

880.24.1 Definition - Stabilizing and protecting banks of streams or excavated channels against scour and erosion by structural means.

880.24.2 Scope - This standard covers structural measures used to stabilize and protect the banks of natural streams and excavated channels. It does not cover the vegetative measures that may be used for streambank protection, either when used alone or to supplement the mechanical measures.

880.24.3 Design_Criteria - Since each reach of channel is unique, measures for streambank protection must be installed according to a plan and adapted to the specific site. Designs shall be developed in accordance with the following principles:

(1) Protective measures to be applied shall be compatible with improvements planned or being carried out by others.

(2) The grade must be controlled; either by natural or artificial means, before any permanent type of bank protection can be considered feasible unless the protection can be safely and economically constructed to a depth well below the anticipated lowest depth of bottom scour.

(3) Streambank protection shall be started and ended at a stabilized or controlled point on the stream.

(4) Needed channel clearing to remove stumps, fallen trees, debris, and bars which force the stream flow into the streambank shall be an initial element of the work.

(5) Changes in channel alignment shall be made only after an evaluation of the effect of the land use, interdependent water disposal system, hydraulic characteristics, and existing structures.

(6) Structural measures must be effective for the design flow and be able to withstand greater floods without serious damage.

(7) Vegetative protection shall be considered on the upper portions of eroding banks and especially on those areas that are subject to infrequent inundation.

880.24.4 Construction Specifications - Measures and construction methods that enhance fish and wildlife values shall be incorporated as needed and practical. Special attention will be given to protecting and maintaining key shade, food, and den trees and to stabilization of disturbed areas. Removal of any trees and brush required will be done in such a manner as to avoid damage to other trees and property.

Disposal of trees, brush, and other material will be done in such a manner as to have the least detrimental effect on the environment.

Construction operations shall be carried out in such a manner that erosion, and air and water pollution will be minimized and held within legal limits.

The completed job shall present a workmanlike finish.

SECTION 881

RIPRAP BLANKET

881.1 General

In areas designated on plans, provide a riprap blanket of stone and filter cloth to grades, lines and dimensions indicated or as established in the field by the Engineer. Rip-rap shall conform to Section 804 of the SCDOT Standard Specifications.

881.2 MATERIALS

881.2.1 Stone: Hard quarry or field stone that will not disintegrate on exposure to water or weathering, suitable in every respect for purpose intended. Individual stones or pieces, except spalls, shall be not less than 12 inches in any dimension and shall range in weight from 25 lbs. to 150 lbs., with at least 50% of the pieces weighing more than 60 lbs.

881.2.2 Filter cloth: Poly-Filter X, as manufactured by Cartage or approved equal.

881.3 CONSTRUCTION

Immediately prior to construction of riprap, the slopes or ground surfaces shall be trimmed to proper lines and grades. Where filling of depressions is required, the affected areas shall be compacted.

Plastic filter cloth shall be laid, not stretched, over surfaces to receive riprap, perpendicular to direction of flow and overlapped not less than 12 inches. Sheets shall be anchored in place with securing pins through the cloth along all edges and overlaps.

Each stone shall be carefully placed by hand, perpendicular to the slope, and firmly bedded against the plastic filter cloth and the adjoining stone. Extreme care shall be exercised to avoid the weight of the stone causing over-stressing the plastic fibers and tearing the cloth.

Spaces between larger stones shall be filled with spalls of suitable size tightly fitted into place.

The finished riprap surface shall be even, tight, true to line, grade and section. Unless otherwise indicated, minimum thickness of the complete stone layer shall be 12 inches, measured perpendicular to the surface.

CLEAN UP

SECTION 890

890.1 General

890.1.1 Immediately after completion of the work or any substantial unit or portion of it, the contractor shall remove all unused material, refuse and dirt placed by him in the vicinity of the work and shall leave the premises in a neat and orderly condition, satisfactory to the Engineer.

A. Site: The contractor shall clean up behind the work as much as is reasonably possible as the work progresses. Upon completion of the work, and before acceptance of, and final payment for the project by the owner, the contractor shall remove all of his surplus and discarded materials, excavated material and rubbish from the roadways, sidewalks, parking areas, lawns and all adjacent property; shall restore in an acceptable manner, all property, both public and private which has been disturbed or damaged during the prosecution of the work; and shall leave the whole site in a neat and presentable condition.

Where work is along streets or highways and dirt has been placed on the pavement, the pavement shall be swept clean of all dirt after backfill has been completed.

All equipment, trailers, temporary utilities and buildings belonging to the contractor shall be removed from the job site.

B. Building: Clean up operations shall consistently be carried only the contractor to keep the premises free at all times from an accumulation of waste materials and rubbish. Upon completion of the work, he shall remove all rubbish, tools, scaffolding, surplus materials, etc., from the building and shall leave his work in a condition satisfactory to the Engineer. The general construction contractor shall do the following special cleaning for all trades upon completion of the work:

1. Remove putty stains and paint from glass and wash and polish all glass. Do not scratch or otherwise damage glass.

2. Remove all marks, stains, fingerprints and other soil and dirt from painted, stained and decorated work.

3. Remove all temporary protections and clean and polish floors.

4. Clean and polish all hardware for all trades. This shall include removal of all stains, dust, dirt, paint, etc.

_____C. Pipelines: Clean up along pipelines shall be accomplished as the work progresses. In no case shall more than 1,000 feet of pipeline be left in an "un-cleaned up"

condition. Any barricades or construction signs necessary for safety shall be left in place and maintained until the site, slopes, grass, etc. have stabilized.