



OFFICE OF PROCUREMENT SERVICES
335 FOUR MILE ROAD
CONWAY, SC 29526-6005

AMENDMENT No. # 1

Posting Date: Monday, June 15, 2020

Solicitation Number: 1920-70RF

Description: CDL Training and Propane Fueling

AMENDMENTS TO SOLICITATION: (a) The Solicitation may be amended at any time prior to opening. All actual and prospective Offerors should monitor the following web site for the issuance of Amendments: <https://vrapp.vendorregistry.com/Bids/View/BidsList?BuyerId=2f302e8a-69b0-407b-a21a-3368d004365e> (b) Offerors shall acknowledge receipt of any amendment to this solicitation (1) by signing and returning the amendment, (2) by letter, or (3) by submitting a bid that indicates in some way that the bidder received the amendment. (c) If this solicitation is amended, then all terms and conditions which are not modified remain unchanged. [02-2A005-1]

QUESTIONS FROM OFFERORS - AMENDMENT (JUN 2017): The solicitation is amended as provided herein. Information or changes resulting from questions will be shown in a question-and-answer format. All questions received have been reprinted below. The "District's Response" should be read without reference to the questions. The questions are included solely to provide a cross-reference to the potential offeror that submitted the question. Questions do not form a part of the contract. The "District's Response" does. Any restatement of part or all of an existing provision of the solicitation in an answer does not modify the original provision except as follows: underline text is added to the original provision. Stricken text is deleted. [02-2A097-1]

SUBMIT OFFER BY (OPENING DATE) HAS CHANGED: The new Bid Opening Date is **June 19, 2020 at 1:30 PM**

PROJECT MANAGER CHANGES: Changes are for clarification purposes; due to the bid opening date, no additional questions will be allowed.

1. The Scope of Work (Exhibit A) has been updated, [See attached](#).
2. The Official Bid Form has been updated, [See the attached](#).
3. The Official Plans Bid Set has been updated, [See attached](#).
4. The Official Technical Specification Bid Set has been updated, [See attached](#).

HORRY COUNTY SCHOOLS

By:

Robin B. Strickland, CPPB
Procurement Officer

SCOPE OF WORK (Exhibit A)

Revised 6/11/20



PROJECT NUMBER: 1920-70 RF	PROJECT NAME: CDL TRAINING & PROPANE FUELING
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The following information and terms and conditions are provided specific to the project identified in this contract:

- DISTRICT PROJECT MANAGER:** Name: Jason Hardee, Project Manager
Telephone: 843-488-6574 Fax: 843-488-6714 E-mail: jhardee@horrycountyschools.net Mobile: 843-340-4588
- OTHER PROJECT REPRESENTATIVE(S):** Name: Mark A. Wolfe, Executive Director of Facilities
Telephone: 843-488-6967 Fax: 843-488-6714 E-mail: mwolfe002@horrycountyschools.net
- ARCHITECT / ENGINEER (if any):** Address: ECLS GLOBAL, INC. 350 Hilton Road, Suite 103, Myrtle Beach, SC 29572
Contact: Brian Sexton, PE Phone: 843-945-2064 Email: BrianS@eclsglobalinc.com
- DISTRICT PROCUREMENT OFFICER:** Robin Strickland, CPPB, at rstrickland@horrycountyschools.net or 843-488-6893
- CONTRACTOR'S PRINCIPAL/OWNER:** Name: .
Telephone: . Fax: . E-mail: . Mobile: .
- CONTRACTOR'S PROJECT MANAGER:** Name: .
(if required) Telephone: . Fax: . E-mail: . Mobile: .
- CONTRACTOR'S WORKSITE SUPERINTENDENT:** Name: .
Telephone: . Fax: . E-mail: . Mobile: .
- CONTRACTOR'S SECONDARY WORKSITE SUPERINTENDENT:** Name: .
(if required) Telephone: . Fax: . E-mail: . Mobile: .
- APPROVAL OF CONTRACTOR USE OF DISTRICT FACILITIES (as checked):** Water Electrical Power Restroom Facilities Vending Machines Debris and Recycle Containers Other: No use of District facilities allowed.
- LIQUIDATED DAMAGES:** \$ 500.00 / day
- RETAINAGE TO BE WITHHELD:** 3.5% from every payment until final completion of the work in accordance with the contract documents
 None
- CONSTRUCTION WORKSITE MEETINGS HELD:** Weekly Every Two Weeks Twice Monthly Once Monthly
- SOURCE OF PROJECT FUNDS:** Federal Source Other Sources (non-Federal)
- CONTRACTOR WARRANTY TERMS:** 60 days 90 days 180 days 365 days (1 year) 730 days (2 years)

The Contractor shall provide, at the time the *Contract Agreement* is executed by the Contractor and returned to the District, the following checked items:

- A copy of business licenses valid in the jurisdiction where the construction work will be performed for the Contractor.
- A copy of contractor licenses issued by the South Carolina Licensing and Regulation Board for the Contractor and each subcontractor.
- A valid, original Certificate of Insurance.
- SLED checks maintained in the Contractor's file on all Contractor and subcontractor employees, agents and representatives who will access the worksite during performance of the construction work or other services. (Do not submit to the District until requested.)
- Certification of Approved Installer (on manufacturer's, fabricator's or supplier's letterhead) for
- Other:
- Other:

PERMITS, INSPECTIONS, APPROVALS OF REGULATORY AUTHORITY AND ASSIGNED RESPONSIBILITY:

1. No Building permit will be issued by local jurisdictions.
2. Office of School Facilities is the Authority having Jurisdiction and will conduct inspections of this work, including a final inspection.
3. Design Engineer will inspect and Horry County may inspect the storm water management practices, site utility work, and zoning compliance.
4. Chapter 1 and Chapter 17 inspections will be performed by an Independent Testing Agency paid for by the District.
5. Business licenses will be required by the City of Conway for the General Contractor, all Subcontractors, or as required by the City/County.
6. The Contractor's schedule and work will coordinate with utility owners' connections to this project. Connections to be paid for by the District.

DETAILED DESCRIPTION OF WORK TO BE PERFORMED:

The Contractor will be responsible and required to meet the following:

1. Meet all the document requirements in the Contract Agreement including the attachments starting with Exhibit A through Exhibit G.
2. The Contractor and the District agree to the Scope of Work and other terms identified herein as a part of the contract.

3. Shall furnish all labor, materials, tools, and equipment necessary to perform and complete the installation of asphalt, concrete sidewalks, and all associated utilities and appurtenances, including but not limited to pavement, striping, pedestrian access, stormwater drainage, and site improvements at the following locations: HCS Records Site.
4. Proper Identification as a worker/visitor to the school campus must be readily visible by staff and students, in the form of a company supplied ID Badge.
 - a. Proper Identification comes in two forms and is required by all persons performing work for the general contractor and all sub-contractors: Government-issued; or Photo ID badge with company name; and PPE (Personal Protective Equipment).
 - b. ID Badges are required for ALL personnel on-site and must be worn/visible at all times. Any person that does not have the proper ID Badge and is not visible will be asked to leave the property immediately. ID Badges must be laminated or of credit card type material that resists wear and fading. Faded badges are invalid.
 - c. PPE (Personal Protective Equipment) is a minimum of international orange/yellow shirt and hard hat. Other forms of personnel visibility and head protection are accepted. Additional PPE measures must be supplied by the contractor for their appropriate trade, such as eye/ear protection, gloves, footwear, etc.
5. Chapter One and Chapter Seventeen Inspections and Material Testing Services will be performed by an inspection agency retained by the District. The Contractor is required to coordinate his work with the testing agency.
 - a. Contractor shall reference and implement any and all recommendations contained within the geotechnical report prepared by ECLS Global, Inc. for this project.
 - b. Report of Subsurface Exploration and Preliminary Geotechnical Evaluation Horry County Schools Records Center Site, 2205 Church Street, Conway SC 29526 Building & Earth Project No.: RD200105
 - c. All soil borings, testing results, findings, and recommendations prepared by the geotechnical engineer must be considered in the Contractors base bid price when considering the installation of all pavement sections on the site.
 - d. Costs associated with the removal and replacement of unsuitable material will be the responsibility of the Contractor. This applies to all excavations, borrow materials, and imported soils, stone, etc. within the limits of disturbance.
 - e. Contractor will accept responsibility for costs of retesting due to test failures or failure to be ready for a scheduled test.
 - f. The Contractor shall coordinate and schedule required testing with the inspection agency through the District Project Manager.
 - g. If Contractor encounters soil material that is unsuitable for subgrade material under roadway or foundations, then Contractor shall remove and replace this material as required by third party inspection to achieve passing density and proof roll tests.
 - h. If Contractor encounters soil material that is tested and approved by third party for use as suitable subgrade for roadway or foundations, then Contractor must schedule work such that delays will not allow material to be exposed to adverse weather conditions such that it becomes unsuitable. If this occurs, all costs associated with the removal and replacement of unsuitable material exposed to adverse weather conditions will be the responsibility of the Contractor.
 - i. The Contractor shall be responsible for coordinating all required testing and inspections by the Office of School Facilities, i.e. through the Engineer and HCS.
6. The Contractor shall include an **allowance of**:
 - a. **\$25,000** for Electrical Services supplied from the existing panel in the existing Records Building to the Propane Fueling Station
 - b. **\$10,000** for Unforeseen conditions
 - c. **\$ 75,000** for Landscaping (including all labor and material in install: Sodding, Trees, Shrubs, Bedding)
DOES NOT include: Hydro seeding, maintenance and care for 1 year after substantial competition.
7. The Contractor is responsible for restroom facilities for all its employees and any subcontractors to utilize during this project. The facilities inside the school are off-limits during school hours and after school hours.
8. Contractor accepts responsibility for all receiving, unloading, handling, full care and custody of all materials. Site security personnel will not be provided by the District. Access to the school campus for the duration of the Work will be 7:00 am to 7:00 pm; 7-days per week.
9. All areas inside the HCs buildings are to be off-limits to the construction forces. All exterior ingress/egress doors and walkways are to be maintained and door openings are to be sealed to minimize dust infiltration from affecting school equipment, etc. The contractor is responsible for all safety barricades and signage as needed to complete the work during school days when school is in session. Students must be separated from construction activity at all times. Contractor shall provide all protection necessary to ensure the Work shall be completed without damage or deterioration to existing District property. The Contractor must include in the bid the cost to furnish and install protection fencing and etc. to ensure that the district's property is not damaged, and students are kept safely at a workable distance. Temporary fencing will be galvanized. Orange construction fence is not allowed.
 - a. Exception: The Contractor will need to notify the HCS Project Manager (Jason Hardee: 843-340-4588 or jhardee@horrycountyschools.net) to schedule the tie-in of the electrical to the existing panel.
10. There shall be no construction activity or deliveries in drop-off and pick-up areas during the student Drop-Off and Pick-up time at the beginning and ending of the school day.
11. No open trenches to be left overnight and work areas must be barricaded with galvanized fence to prevent unauthorized access after-hours.
12. Excavations left open after concrete pours must be barricaded with galvanized fence to prevent unauthorized access after-hours. This applies to footings, stormwater excavations, etc.
13. The Contractor will be responsible for the placement of sod in all disturbed areas as shown on the Construction Drawings. The grass is to be watered and maintained until the root system is established.
 - a. Mesh backing on sod is NOT allowed.
14. A pre-installation meeting will be required prior to the following activities:
 - a. Clearing/grubbing operations
 - b. Utilities Connections
 - c. Paving
15. The Contractor must adjust construction activities to provide safe access to the schools for essential District activities during the school year and summer breaks as required.
16. The Contractor will minimize construction noise at all times to the maximum extent possible. During the time when standardized testing is occurring, limited to zero construction activity will be allowed adjacent to the school building. Work that does not disturb testing is permitted. The Contractor will need to coordinate with the HCS Project Manager (Jason Hardee: 843-340-4588 or jhardee@horrycountyschools.net) to determine when and where the testing will be conducted throughout the contract period. A list of scheduled testing dates will be provided to the Contractor, when a schedule is available in the 2020-2021 academic year, where disturbance to the students testing environment is not allowed.
17. The Contractor is responsible for identifying the location of all utilities. Any utilities that are interrupted or damaged by the Contractor or any subcontractor must be repaired before the Contractor leaves the job site that day. Any interruption in service will need to be coordinated and approved in advance with HCS Project Manager (Jason Hardee: 843-340- 4588 or jhardee@horrycountyschools.net).

18. The Contractor will secure all materials and equipment during construction to insure safe means of egress to and from the school building at all times.
19. The Contractor is required to:
- a. Have a job superintendent present on the property while **any and all** work is being performed.
 - b. Provide adequate staffing at all times to maintain the construction schedule.
 - c. Have the Job Superintendent attend the Weekly progress meeting onsite.
 - i. The time, day and location will be agreed upon prior to start of construction.
 - ii. These meetings will be scheduled to address questions, issues, schedules, and update the progress of the project.
 - iii. The Contractor shall have each Subcontractor's Superintendents in attendance when their portion of the project is scheduled to begin within 2 weeks and throughout the time that they are working onsite as well as have each Material Supplier's Representative in attendance when their portion of the project is scheduled to begin within 2 weeks and throughout the time that they are working onsite.
20. The Contractor shall provide the following documents to ECLS Global, Inc. and the HCS Project Manager prior to HCS issuing a Certificate of Final Completion:
- a. Punch list with anticipated completion dates
 - b. As-Built plans in CAD and PDF formats
 - c. Warranties
 - d. O & M Manuals
 - e. Shop Drawings
 - f. HCS Closeout Documents
21. The Contractor shall issue a one-year warranty along with all manufacturer's warranties starting on the date of substantial completion of all the work completed in each phase of the project.

The Contractor and District agree to the Scope of Work and other terms identified herein as an integral part of the *Contract Agreement*.

End of Exhibit A

OFFICIAL BID FORM

Revised 6/11/20



BID NUMBER: 1920-70RF
 PROJECT NAME: CDL Training & Propane Fueling

FULL COMPLETION OF THIS FORM IS **MANDATORY** FOR A BID TO BE CONSIDERED. (This *Official Bid Form* and all requested documentation shall be mailed, expressed or hand delivered to the location(s) specified in the *Invitation for Bids* **no later than** the bid opening date and time, as may be amended by addendum.)

BASIC SUBMITTER INFORMATION:

Name of Submitting Company: _____
 Mailing Address of Company: _____
 Taxpayer Identification Number: _____
 Qualifier's Name: _____ Phone Number: _____
 Contractor's License Number: _____ Fax Number: _____
 Contractor's Group Number: _____ Dollar Limitation of License: \$ _____
 Email Address: _____
 Company's Minority Status: Minority Owned Business Woman Owned Business Not Applicable
 (Must be certified by the State of South Carolina and will be used for statistical purposes only. Check if State certified:)

ADDENDA ACKNOWLEDGEMENT: (Acknowledgement of all addenda issued is required.)

<u>ADDENDA NO.</u>	<u>ADDENDA DATE</u>	<u>BIDDER'S INITIALS</u>	<u>ADDENDA NO.</u>	<u>ADDENDA DATE</u>	<u>BIDDER'S INITIALS</u>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

BID PRICING: Having carefully examined the Contract Documents with all corresponding terms, conditions, requirements, specifications, drawings, forms or other such descriptions of the work to be performed as well as the worksite and conditions affecting the work, the undersigned proposes to furnish all materials, labor, equipment and processes necessary for the **base bid** and **bid alternates** listed below. (Failure of the Bidder to bid any alternate listed shall render the bid non-responsive. Check box to indicate addition, reduction, or no change from base bid.) **Round all bids to the nearest dollar.**

BASE BID (Lump Sum): (Include any allowances) Dollars: \$ _____

(CAUTION: Bidders are required to include ALL costs in the above Base Bid and each Bid Alternate, if any. If the bid is accepted, the District will not contract for more than the amounts shown. The District reserves the right to accept bid alternates in any order or combination that serves its best interests and is within budget. If any numbers are illegible, the District's interpretation of the number is final.)

UNIT / INCREMENTAL PRICING: Unit pricing must be provided in the event a *Change Order* is necessary for the following types of work due to unforeseen circumstances. These unit prices shall be the installed price including all costs to the District. Unit costs shall not include bonding, overhead and profit, which shall be added at time of *Change Order*. The District reserves the right to negotiate any of the unit prices listed and, at the District's discretion, to use the same rates for deduct work under a *Change Order*.

1	2" Asphalt Surface Course (Type C)	\$		per	ton
2	2" Asphalt Surface Course (Type C)	\$		per	SY
3	1.5" Asphalt Binder Course (Type C)	\$		per	ton
4	1.5" Asphalt Binder Course (Type C)	\$		per	SY
5	1.5" Asphalt Surface Course (Type C)	\$		per	ton
6	1.5" Asphalt Surface Course (Type C)	\$		per	SY
7	G.A.B.C 6"	\$		per	ton
8	G.A.B.C 6"	\$		per	SY
9	G.A.B.C 8"	\$		per	ton
10	G.A.B.C 8"	\$		per	SY
11	G.A.B.C 10"	\$		per	ton

12	G.A.B.C 10"	\$		per	SY
13	4" Concrete Sidewalk (4000 psi w/fiber mesh)	\$		per	SF
14	6" Concrete Sidewalk (4000 psi w/fiber mesh)	\$		per	SF
15	15" RCP	\$		per	LF
16	18" RCP	\$		per	LF
17	24" RCP	\$		per	LF
18	30" RCP	\$		per	LF
19	36" RCP	\$		per	LF
20	42" RCP	\$		per	LF
21	48" RCP	\$		per	LF
22	24" RCP Culvert	\$		per	LF
23	30" RCP Culvert	\$		per	LF
24	36" RCP Culvert	\$		per	LF
25	4x4 Concrete Junction Box	\$		per	Each
26	8" PVC (SDR-35)	\$		per	LF
27	12" PVC (SDR-35)	\$		per	LF
28	12" PVC (SDR-18)	\$		per	LF
29	18" Curb & Gutter	\$		per	LF
30	12" HDPE Underdrain with 18" Rock Envelope	\$		per	LF
31	10" HDPE Underdrain with 18" Rock Envelope	\$		per	LF
32	8" HDPE Underdrain with 18" Rock Envelope	\$		per	LF
33	6" HDPE Underdrain with 12" Rock Envelope	\$		per	LF
34	4" HDPE Underdrain with 12" Rock Envelope	\$		per	LF
35	Remove & Replace Existing Catch Basin Top	\$		per	Each
36	Replace ex. catch basin top w/ ADA frame & grate	\$		per	Each
37	Construction Fence – 6' Galvanize	\$		per	LF
38	Silt Fence	\$		per	LF
39	Inlet Protection	\$		per	Each
40	Concrete Wheel Stops	\$		per	Each
41	Imported Fill	\$		per	CY
42	Remove Unsuitable Soils	\$		per	CY
46	Striping	\$		per	LF
47	Inspect/Seal/Clean Existing Onsite Drainage Boxes	\$		per	Each
48	Asphalt/Cement Reclamation Stabilization	\$		per	SY
49	Backhoe w/ Operator - Rental	\$		per	HR
50	Small Excavator w/ Operator - Rental	\$		per	HR
51	Large Excavator w/ Operator - Rental	\$		per	HR
52	Dozier w/ Operator - Rental	\$		per	HR
53	Demo Asphalt & Disposal	\$		per	SY
54	Demo Concrete & Disposal	\$		per	SY
55	General Labor	\$		per	HR
56	Foreman	\$		per	HR
57	Supervisor	\$		per	HR
43	Top Soil	\$		per	CY
44	Centipede Sod	\$		per	SF
45	Bermuda Sod	\$		per	SF
58	Crape Myrtle - 8-9 Feet Height - Multi Trunk 30 gal	\$		per	Each
59	Southern Live Oak - 12-14 Feet Height - 3" TR	\$		per	Each
65	Tulip Poplar - 7-8 Feet	\$		per	Each

66	Shrub Holly - 4-5 Feet Height	\$		per	Each
60	Dwarf Yaupon Holly Evergreen - 18"x18" - 3 gal	\$		per	Each
61	Yaupon Holly Evergreen - 18"x18" - 3 gal	\$		per	Each
61	Wax Myrtle - Evergreen - 2 gal	\$		per	Each
62	Juniper - 3 gal	\$		per	Each
63	Long Leaf Pine Straw	\$		per	Bail
64	Dark Chocolate Wood Chip Mulch	\$		per	CY

CONFLICTS OF INTEREST IDENTIFICATION: Identify any employee, agent or representative of the Architect/Engineer or District (including members of the Horry County Board of Education) with more than a five percent (5%) interest in the Contractor's business. Not applicable

Names: _____

Identify any employee, agent or representative of the Architect/Engineer or District (including members of the Horry County Board of Education) that will be subcontracting any work for the project. Not applicable

Names: _____

ACKNOWLEDGEMENT:

1. Have you clearly listed any deviations from the requested specifications and fully explained such deviations? Yes No N/A – No Deviations

BID CERTIFICATION: I, the undersigned, certify that I am an authorized signatory for the bidding company identified in this bid form with authority to submit bids and obligate the company to a contract for the work identified in the Contract Documents provided by Horry County Schools. I have read and fully understand the Contract Documents such that I have full knowledge of all of the work to be performed and the terms, conditions, and requirements the company I represent must comply with if a contract is awarded. I further understand that the bidding company I represent must comply with all applicable local, state and federal laws related to the work to be performed and to the payment of subcontractors. I certify that the information included on this form or as attached supplementary information is true and accurate to the best of my knowledge, understanding, and belief. I understand that misrepresentation of any information on this form shall result in the bid being considered non-responsive.

BIDDER:	NOTARY:	CORPORATE SEAL:
Name & Title of Authorized Signatory:	State of: _____ County of: _____ Subscribed and sworn to before me on this date:	
Signature: _____	Signature: _____	
	My Commission Expires:	

REMINDER: The following documents must be submitted with this *Official Bid Form*:

1. A fully executed *Bid Bond*, including power of attorney, or other approved security.
2. Other documents as checked and identified below:

ECLS GLOBAL

CVE CERTIFIED SDVO SB

Regional Office

Arcadian Shores Office Park
350 Hilton Rd. Suite 103
Myrtle Beach, SC 29572
(843) 945-2064

Headquarters

19 N McKinley St.
Coats, NC 27521
(910) 897-3257

Regional Office

Urb. Mansiones SA 49 Plaza 2,
Toa Baja, PR 00949
(787) 633-4370

HORRY COUNTY SCHOOLS

PROJECT SPECIFICATIONS

Propane Bus Fueling Station & CDL Training Pad @
Horry Records Center, 2205 Church Street, Conway, SC

June 7, 2020

ECLS Global, Inc. Consulting Engineers & Surveyors
Contact: Brian Sexton, P.E.
South Carolina Registration No. 26409



6-7-2020



**Propane Bus Fueling Station & CDL Training Pad @
Horry Records Center
June 8, 2020**

Addendum 1

PROJECT SPECS – TABLE OF CONTENTS

Table of Contents

<u>TECHNICAL SPECIFICATIONS - PER ADDENDUM #1</u>		(93 total pages)
<u>DIVISION 31 – EARTHWORK</u>		
31 11 00	CLEARING AND GRUBBING	(1 page)
31 23 00.00 20	EXCAVATION AND FILL	(5 pages)
31 05 19	GEO-TEXTILE	(3 pages)
		(9 total pages)
<u>DIVISION 32 – EXTERIOR IMPROVEMENTS</u>		
32 11 20	BASE COURSE FOR RIGID AND FLEXIBLE PAVING	(4 pages)
SCDOT Section 305	GRADED AGGREGATE BASE (excerpted from 2007 Manual)	(9 pages)
SCDOT Section 309	ASPHALT BASE COURSE TYPE C & D (excerpted from 2007 Manual)	(4 pages)
SCDOT Section 401	HOT MIX ASPHALT (HMA) PAVEMENT (excerpted from 2007 Manual)	(30 pages)
SCDOT Section 402	HMA INTERMEDIATE COURSE (excerpted from 2007 Manual)	(2 pages)
SCDOT Section 403	HMA SURFACE COURSE (excerpted from 2007 Manual)	(2 pages)
32 13 13.06	PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS & SITE FACILITIES	(8 pages)
32 16 19	CONCRETE CURBS, GUTTERS AND SIDEWALKS	(9 pages)
32 17 23	PAVEMENT MARKINGS	(7 pages)
		(75 total pages)
<u>DIVISION 33 – UTILITIES</u>		
33 40 00	STORM DRAINAGE UTILITIES	(9 pages)

-- End of Project Table of Contents --

SECTION 31 11 00

CLEARING AND GRUBBING

1.1 CLEARING

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of dead branches 1-1/2 inches or more in diameter and shall be trimmed of all branches the heights indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint.

1.2 Grubbing

Grubbing consists of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. Remove material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for buildings, and areas to be paved. Fill depressions made by grubbing with suitable material and compact to make the surface conform with the original adjacent surface of the ground.

1.3 DISPOSAL OF MATERIALS

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of outside the limits of Disturbance at the Contractor's responsibility, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 31 23 00.00 20

EXCAVATION AND FILL

PART 1 Not Used

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Satisfactory Materials

Any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC, free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and frozen, deleterious, or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.1.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials. Unsatisfactory materials also include man-made fills, trash, refuse, or backfills from previous construction. Unsatisfactory material also includes material classified as satisfactory which contains root and other organic matter, frozen material, and stones larger than 3 inches. The Contracting Officer shall be notified of any contaminated materials.

2.1.3 Common Fill

Approved, unclassified soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.4 Backfill and Fill Material

ASTM D2487, classification GW, GP, GM, GC, SW, SP, SM, SC with a maximum ASTM D4318 liquid limit of 20, maximum ASTM D4318 plasticity index of 12, and a maximum of 25 percent by weight passing ASTM D1140, No. 200 sieve.

2.1.5 Select Material

Provide materials classified as SP-SM or better classification by ASTM D2487 where indicated. The liquid limit of such material shall not exceed 20 percent when tested in accordance with ASTM D4318. The plasticity index shall not be greater than 12 percent when tested in accordance with ASTM D4318, and not more than 12 percent by weight shall be finer than No. 200 sieve when tested in accordance with ASTM D1140.

Bearing Ratio: At 0.1 inch penetration, the bearing ratio shall be a minimum of 20 percent at 95 percent ASTM D1557 maximum density as determined in accordance with ASTM D1883 for a laboratory soaking period of not less than 4 days. Maximum expansion shall be 3 percent.

Provide as specified in Section 32 92 23 SODDING.

Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

2.2 POROUS FILL FOR CAPILLARY WATER BARRIER

ASTM C33 coarse aggregate Size 57 and conforming to the general soil material requirements specified in paragraph entitled "Satisfactory Materials."

2.3 UTILITY BEDDING MATERIAL

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D1557 maximum density. Plastic piping shall have bedding to spring line of pipe.

Provide ASTM D2321 materials as follows:

- a. Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
- b. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D2487.

2.4 BORROW

Obtain borrow materials required in excess of those furnished from excavations from sources outside of Owner property.

Dispose of materials from clearing and grubbing operations off Owner property at a permitted facility. 2.5

BACKFILL FOR UNDERDRAINAGE SYSTEMS

Clean sand, crushed rock, or gravel meeting the following requirements:

- a. Perforated or Slotted-Wall Pipe: Backfill meeting requirements of Type I material as specified in Table 1.
- b. Open Joint Pipe: Backfill consisting of both Type I and Type II materials as specified in Table 1.
- c. Blind or French Drains: Backfill consisting of Type II material as specified in Table 1.
- d. Any Type Drain Used With Filter Fabric: Clean gravel or crushed stone or gravel conforming to ASTM C33 coarse aggregate grading size 57 fill consisting of Type II material as specified in Table 1.

Table 1

	Type I Gradation E 11 ASTM C33	Type II Gradation 57 ASTM C33	
ASTM D422 Sieve Size	Percent Passing	Percent Passing	
1.5 inches	--	100	
1 inch	--	90 - 100	
3/8 inch	100	25 - 60	
No. 4	95 - 100	5 - 40	
No. 8	--	0 - 20	
No. 16	45 - 80	--	
No. 50	10 - 30	--	
No. 100	0 - 10	--	

2.6 MATERIAL FOR RIP-RAP

Bedding material Filter fabric and rock conforming to DOT South Carolina State Standard for construction indicated.

2.6.1 Bedding Material

Consisting of sand, gravel, or crushed rock, well graded, or poorly graded with a maximum particle size of 2 inches. Material shall be composed of tough, durable particles. Fines passing the No. 200 standard sieve shall have a plasticity index less than six.

2.7 BURIED WARNING AND IDENTIFICATION TAPE

Metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

Warning Tape Color Codes	
Red:	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Potable Water Systems
Green:	Sewer Systems
Purple:	Non Potable, Reclaimed Water, Irrigation and Slurry lines

2.7.1 Warning Tape for Metallic Piping

Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.7.2 Detectable Warning Tape for Non-Metallic Piping

Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.8 DETECTION WIRE FOR NON-METALLIC PIPING

Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 EXECUTION

3.1 PROTECTION

3.1.1 Shoring and Sheeting

Provide shoring trench boxes and sheeting where required, according to subsurface conditions and depth of trench. In addition to Section 25 A and B of COE EM-385-1-1, include provisions in the shoring and sheeting plan that will accomplish the following:

- A. Prevent undermining of pavements, foundations and slabs.
- B. Prevent slippage or movement in banks or slopes adjacent to the excavation.
- C. Allow for the abandonment of shoring and sheeting materials in place in critical areas as the work is completed. In these areas, backfill the excavation to within 3 feet of the finished grade and remove the remaining exposed portion of the shoring before completing the backfill.

3.1.2 Drainage and Dewatering

Plan for and provide the structures, equipment, and construction for the collection and disposal of surface and subsurface water encountered in the course of construction.

3.1.2.1 Drainage

Surface water shall be directed away from excavation and construction sites so as to prevent erosion and undermining of foundations. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing. Excavation shall be performed so that the site and the area immediately surrounding the site and affecting operations at the site shall be continually and effectively drained.

3.1.3 Dewatering

Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, the water level shall be maintained continuously, at least 3 feet below the working level. Operate dewatering system until work below existing water levels is complete. Measure and record performance of dewatering system. Have back-up pump and system available for immediate use.

3.1.4 Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the Harnett County Public Utilities Department regarding location of existing utilities.

3.1.5 Structures and Surfaces

Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance. Protect existing streams, ditches, and storm drain inlets from water-borne soil by means of as indicated on the contract drawings.

3.1.5.1 Disposal of Excavated Material

Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work. Deliver and properly manage any surplus soil that cannot be reused on its originating site to one of the following locations:

- a. Offsite areas within the County as follows:
 - (1) Horry County Landfill, off Hwy 90.
 - (2) Other location approved by the Contracting Officer.

Contractor shall provide temporary silt fencing around designated stockpile areas as needed.

-- End of Section --

SECTION 31 05 19

GEOTEXTILE

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Thread

Manufacturing Quality Control Sampling and Testing

1.2 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle geotextile in accordance with ASTM D4873.

1.2.1 Delivery

Notify the Contracting Officer a minimum of 24 hours prior to delivery and unloading of geotextile rolls packaged in an opaque, waterproof, protective plastic wrapping. The plastic wrapping shall not be removed until deployment. If quality assurance samples are collected, immediately rewrap rolls with the plastic wrapping. Geotextile or plastic wrapping damaged during storage or handling shall be repaired or replaced, as directed. Label each roll with the manufacturer's name, geotextile type, roll number, roll dimensions (length, width, gross weight), and date manufactured.

1.2.2 Storage

Protect rolls of geotextile from construction equipment, chemicals, sparks and flames, temperatures in excess of 160 degrees F, or any other environmental condition that may damage the physical properties of the geotextile. To protect geotextile from becoming saturated, either elevate rolls off the ground or place them on a sacrificial sheet of plastic in an area where water will not accumulate.

1.2.3 Handling

Handle and unload geotextile rolls with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Rolls shall not be dragged along the ground, lifted by one end, or dropped to the ground.

PART 2 PRODUCTS

2.1 RAW MATERIALS

A minimum of 7 days prior to scheduled use, submit manufacturer's certificate of compliance stating that the geotextile meets the requirements of this section. For needle punched geotextiles, the manufacturer shall also certify that the geotextile has been continuously inspected using permanent on-line full-width metal detectors and does not contain any needles which could damage other geosynthetic layers.

The certificate of compliance shall be attested to by a person having legal authority to bind the geotextile manufacturer.

2.1.1 Geotextile

Provide geotextile that is a pervious sheet of polymeric material consisting of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. The use of woven slit film geotextiles (i.e. geotextiles made from yarns of a flat, tape-like character) will not be allowed. Add stabilizers and/or inhibitors to the base polymer, as needed, to make the filaments resistant to deterioration by ultraviolet light, oxidation, and heat exposure.

Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. Geotextiles shall meet the requirements specified in Table 1, Table 2, or Table 3. Where applicable, Table 1 property values represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum average roll values.

2.1.1.1 Pavement Section Geotextile Fabric (under CDL pads and Bus Routes)

TABLE 3 MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE			
PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAB STRENGTH	LBS	205	ASTM D4632
SEAM STRENGTH	LBS	185	ASTM D4632
PUNCTURE	LBS	435	ASTM D6241
TRAPEZOID TEAR	LBS	85	ASTM D4533
APPARENT OPENING SIZE	U.S. SIEVE	40	ASTM D4751
PERMITTIVITY	SEC -1	0.05	ASTM D4491
ULTRAVIOLET DEGRADATION	PERCENT	50 AT 500 HRS	ASTM D4355

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Subgrade Preparation

The surface underlying the geotextile shall be smooth and free of ruts or protrusions which could damage the geotextile. Subgrade materials and compaction requirements shall be in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL.

3.1.2 Placement

Notify the Contracting Officer a minimum of 24 hours prior to installation of geotextile. Geotextile rolls which are damaged or contain imperfections shall be repaired or replaced as directed. The geotextile shall be laid flat and smooth so that it is in direct contact with the subgrade. The geotextile shall also be free of tensile stresses, folds, and wrinkles. On slopes steeper than 10 horizontal on 1 vertical, lay the geotextile with the machine direction of the fabric parallel to the slope direction.

3.2 SEAMS

3.2.1 Overlap Seams

Continuously overlap geotextile panels a minimum of 18 inches at all longitudinal and transverse joints. Where seams must be oriented across the slope, lap the upper panel over the lower panel. If approved, sewn seams may be used instead of overlapped seams.

3.2.2 Sewn Seams

Factory and field seams shall be continuously sewn on all slopes steeper than 1 vertical on 3. The stitch type used shall be a 401 locking chain stitch or as recommended by the manufacturer. For field and factory seams which are sewn, provide at least a 2-meter sample of sewn seam before the geotextile is installed. For seams that are field sewn, the seams shall be sewn using the same equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, provide samples of seams from both directions. Seam strength shall meet the minimum requirements specified in Table 1. The thread at the end of each seam run shall be tied off to prevent unraveling. Skipped stitches or discontinuities shall be sewn with an extra line of stitching with a minimum of 18 inches of overlap.

3.3 PROTECTION

Protect the geotextile during installation from clogging, tears, and other damage. Damaged geotextile shall be repaired or replaced as directed. Use adequate ballast (e.g. sand bags) to prevent uplift by wind. The geotextile shall not be left uncovered for more than 7 days after installation.

3.4 REPAIRS

Repair torn or damaged geotextile. Clogged areas of geotextile shall be removed. Perform repairs by placing a patch of the same type of geotextile over the damaged area. The patch shall extend a minimum of 12 inches beyond the edge of the damaged area. Patches shall be continuously fastened using approved methods. The machine direction of the patch shall be aligned with the machine direction of the geotextile being repaired. Remove and replace geotextile rolls which cannot be repaired. Repairs shall be performed at no additional cost to the Owner

3.5 PENETRATIONS

Construct engineered penetrations of the geotextile by methods recommended by the geotextile manufacturer.

3.6 COVERING

Do not cover geotextile prior to inspection and approval by the Contracting Officer. Place cover soil in a manner that prevents soil from entering the geotextile overlap zone, prevents tensile stress from being mobilized in the geotextile, and prevents wrinkles from folding over onto themselves. On side slopes, soil backfill shall be placed from the bottom of the slope upward. Cover soil shall not be dropped onto the geotextile from a height greater than 3 feet. No equipment shall be operated directly on top of the geotextile without approval of the Contracting Officer. Use equipment with ground pressures less than 7 psi to place the first lift over the geotextile. A minimum of 12 inches of soil shall be maintained between full-scale construction equipment and the geotextile.

Cover soil material type, compaction, and testing requirements are described in Section 31 11 00 EXCAVATION AND FILL. Equipment placing cover soil shall not stop abruptly, make sharp turns, spin their wheels, or travel at speeds exceeding 5 mph.

-- End of Section --

SECTION 32 11 20

BASE COURSE FOR RIGID AND FLEXIBLE PAVING

PART 1 GENERAL – Not Used

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aggregate Base Course – Flexible Pavement

Coarse aggregate Type A or B with a gradation of ABC conforming to Section 801 of SCDOT Standard Specifications.

2.1.2 Fine Aggregate – Flexible Pavement

Sand gradation 1S or 2S conforming to Section 801 of SCDOT Standard Specifications.

2.1.3 Select-Material Subbase Course

Provide materials consisting of selected soil or other materials from field excavation, stockpiles, or other sources and free from lumps and balls of clay and from organic and other objectionable matter. Provide materials with not more than 25 percent by weight passing the No. 200 sieve. The portion of material passing the No. 40 sieve must have a liquid limit less than 35 and a plasticity index less than 12. Provide materials having a maximum particle size not exceeding 3 inches. Particles having diameters less than 0.02 mm must not be in excess of 3 percent by weight of the total sample tested as determined in accordance with AASHTO T 88.

2.1.4 Rigid Pavement Base Course

Provide aggregates consisting of crushed stone or slag, gravel, shell, sand, or other sound, durable, approved materials processed and blended or naturally combined. Provide aggregates which are durable and sound, free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material. The percentage of loss of material retained on the No. 4 sieve must not exceed 50 percent after 500 revolutions when tested in accordance with ASTM C131. At least 50 percent by weight retained on each sieve must have one freshly fractured face with the area at least equal to 75 percent of the smallest midsectional area of the piece.

Provide aggregate that is reasonably uniform in density and quality. Provide slag that is an air-cooled, blast-furnace product having a dry weight of not less than 65 pcf. Provide aggregates having a maximum size of 2 inches and within the limits specified as follows:

Maximum Allowable Percentage by Weight Passing
Square-Mesh Sieve

Sieve Designation	Rigid Pavement Base Course
No. 10	85 %
No. 200	15 %

Particles having diameters less than 0.02 mm must not be in excess of 3 percent by weight of the total sample tested as determined in accordance with AASHTO T 88. The portion of any blended component and of the completed course passing the No. 40 sieve must be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 6. The Contractor is responsible for any additional stability required to provide a working platform for construction equipment. If the Contractor can demonstrate with a test section that a material has adequate stability to support construction equipment, the fractured face requirement can be deleted, subject to the approval of the Contracting Officer.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Provide adequate drainage during the entire period of construction to prevent water from collecting or standing on the working area.

3.2 OPERATION OF AGGREGATE SOURCES

Condition aggregate sources on private lands in accordance with local laws and authorities. Clearing, stripping and excavating are the responsibility of the Contractor. Condition aggregate sources on HCS property to readily drain and leave in a satisfactory condition upon completion of the work.

3.3 STOCKPILING MATERIAL

Clear and level storage sites prior to stockpiling of material. Stockpile all materials, including approved material available from excavation and grading, in the manner and at the locations designated. Stockpile aggregates on the cleared and leveled areas designated by the Contracting Officer to prevent segregation. Stockpile materials obtained from different sources separately.

3.4 PREPARATION OF UNDERLYING COURSE OR SUBGRADE

Clean the underlying course or subgrade of all foreign substances prior to constructing the subbase or rigid pavement base course. Do not construct subbase or rigid pavement base course on underlying course or subgrade that is frozen. Construct the surface of the underlying course or subgrade to meet specified compaction and surface tolerances. Correct ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the specified requirements set forth herein by loosening and removing soft or unsatisfactory material and adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, stabilize the surface prior to placement of the overlying course. Stabilize by mixing the overlying course material into the underlying course and compacting by approved methods. Consider the stabilized material as part of the underlying course and meet all requirements of the underlying course. Do not allow traffic or other operations to disturb the finished underlying course and maintain in a satisfactory condition until the overlying course is placed.

3.5 GRADE CONTROL

Provide a finished and completed subbase and rigid pavement base course conforming to the lines, grades, shown. Place line and grade stakes as necessary for control.

3.6 PLACING MATERIALS

Mix and place the materials to obtain uniformity of the material at the water content specified. Make such adjustments in mixing or placing procedures or in equipment as may be directed to obtain the true grades, to minimize segregation and degradation, to reduce or accelerate loss or increase of water, and to insure a satisfactory subbase course.

3.7 LAYER THICKNESS

Compact the completed course to the thickness indicated. No individual layer may be thicker than 8 inches nor be thinner than 4 inches in compacted thickness. Compact the course(s) to a total thickness that is within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, correct such areas by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course will be considered as conforming to the specified thickness requirements. The average job thickness will be the average of all thickness measurements taken for the job and must be within 1/4 inch of the thickness indicated. Measure the total thickness of the course(s) at intervals of one measurement for each 500 square yards of completed course. Measure total thickness using 3 inch diameter test holes penetrating the completed course.

3.8 COMPACTION

Compact each layer of the material, as specified, with approved compaction equipment. Maintain water content during the compaction procedure to within plus or minus 2 percent of optimum water content determined from laboratory tests as specified in this Section. Begin rolling at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Slightly vary the length of alternate trips of the roller. Adjust speed of the roller as needed so that displacement of the aggregate does not occur. Compact mixture with hand-operated power tampers in all places not accessible to the rollers. Continue compaction of the subbase until each layer is compacted through the full depth to at least 100 percent of laboratory maximum density. Make such adjustments in compacting or finishing procedures as may be directed by the Contracting Officer to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory subbase and rigid pavement base course. Remove any materials that are found to be unsatisfactory and replace with satisfactory material or rework, as directed, to meet the requirements of this specification.

3.9 PROOF ROLLING

In addition to the compaction specified, proof roll subbase course in areas designated on the drawings by application of 6 coverages of a heavy pneumatic-tired roller having four or more tires abreast, each tire loaded to a minimum of 30,000 pounds and inflated to a minimum of 125 psi. A coverage is defined as the application of one tire print over the designated area. In the areas designated, apply proof rolling to the top layer of the completed subbase course. Maintain water content of the top layer of the subbase course as specified in paragraph COMPACTION from start of compaction to completion of proof rolling. Remove any subbase course materials that produce unsatisfactory results by proof rolling and replace with satisfactory materials. Then recompact and proof roll to meet specifications.

3.10 EDGES OF SUBBASE AND RIGID PAVEMENT BASE COURSE

Place approved material along the outer edges of the subbase rigid pavement base course in sufficient quantity to compact to the thickness of the course being constructed. When the course is being constructed in two or more layers, simultaneously roll and compact at least a 2 foot width of this shoulder material with the rolling and compacting of each layer of the subbase and rigid pavement base course, as directed.

3.11 SMOOTHNESS TEST

Construct the top layer so that the surface shows no deviations in excess of 3/8 inch when tested with a 12 foot straightedge. Take measurements in successive positions parallel to the centerline of the area to be

paved. Also take measurements perpendicular to the centerline at 50 foot intervals. Correct deviations exceeding this amount by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.12 FIELD QUALITY CONTROL

3.12.1 In-Place Tests

Perform one of each of the following tests on samples taken from the placed and compacted subbase and rigid pavement base course. Take samples and test at the rates indicated.

- a. Perform density tests on every lift of material placed and at a frequency of one set of tests for every 500 square yards, or portion thereof, of completed area.
- b. Measure the thickness of each course at intervals providing at least one measurement for each 500 square yards or part thereof. Measure the thickness using test holes, at least 3 inches in diameter through the course.

3.12.2 Approval of Material

Final approval of the materials will be based on tests for gradation, liquid limit, and plasticity index performed on samples taken from the completed and fully compacted course(s).

3.13 TRAFFIC

Do not allow traffic on the completed subbase and rigid pavement base course.

3.14 MAINTENANCE

Maintain the completed course in a satisfactory condition until the full pavement section is completed and accepted. Immediately repair any defects and repeat repairs as often as necessary to keep the area intact. Retest any course that was not paved over prior to the onset of winter to verify that it still complies with the requirements of this specification. Rework or replace any area that is damaged as necessary to comply with this specification.

3.15 DISPOSAL OF UNSATISFACTORY MATERIALS

Dispose of any unsuitable materials that have been removed outside the limits of Owner-controlled land. No additional payments will be made for materials that have to be replaced.

-- End of Section --

SECTION 305

GRADED AGGREGATE BASE

305.1 Description

1 This section contains specifications for the materials, equipment, construction, measurement, and payment for construction of a base course composed of the graded aggregate materials specified herein on a properly prepared foundation (sub-grade or sub-base) in conformance with the lines, grades, di-mensions, and cross-sections shown on the Plans or as directed by the RCE.

2 **RESIDENT CONSTRUCTION ENGINEER (RCE) for this project is**

ECLS Global, Inc. Brian Sexton, PE. (all references in SCDOT specs).

When the Contract specifies a graded aggregate base course, the following base courses listed below may appear on the proposal as alternates:

- 3
- Macadam Base Course,
 - 4 • Marine Limestone Base Course, or
 - Recycled Portland Cement Concrete Base Course.

When alternates appear in the proposal, select the intended bid alternate and provide unit bid prices only on that alternate.

1 Marine limestone aggregate is generally found in the coastal plain area of the state and is defined as any limestone aggregate not meeting the classification of dolomitic limestone. Fossiliferous limestone aggregate and recrystallized limestone aggregate are considered marine limestone aggregates.

305.2 Materials

305.2.1 Macadam Base Course

1 Use base course material composed of crushed stone, excluding marine limestone, filled and bound with screenings. Ensure that the aggregate is free from vegetable matter, sand, lumps or balls of clay, or other deleterious matter.

305.2.2 Marine Limestone Base Course

1 Use limestone base course materials produced from a single source or deposit that yields a satisfactory mixture conforming to all requirements of these specifications. Ensure that the Limestone Base Course does not contain clay, sand, organics, or other materials in sufficient quantity to be considered detrimental to the proper bonding, finishing, or strength of the base course.

305.2.3 Recycled Portland Cement Concrete Base Course

2 Use aggregate in the base course consisting of coarse aggregate of crushed, graded, recycled Portland cement concrete mixed together with sand, sand-gravel, soil or other approved materials having similar characteristics and combined as necessary to give a mixture conforming to the requirements given below.

Use aggregate that is free from lumps or balls of clay or other objectionable matter and does not contain metals, wood, brick, plastics, or other unaccept-

able debris.

- 3 When Recycled Portland Cement Concrete Base Course is selected, have the source inspected, sampled and tested, and approved by the MRE and RCE before any material is used in the work. Allow a minimum of 4 weeks for this sampling, testing, and approval.

305.2.4 Coarse Aggregate

305.2.4.1 General

- 1 Use material retained on the No. 4 sieve consisting of hard, durable aggregate particles that are reasonably free from thin or elongated pieces, disintegrated particles, vegetable matter, or other deleterious substances. Ensure that the maximum abrasion loss for coarse aggregate is 65% when subjected to the Los Angeles Abrasion Test (AASHTO T 96).

305.2.4.2 Coarse Aggregate for Macadam Base Course

- 1 Use coarse aggregate for Macadam Base Course consisting of hard, durable particles of crushed slag or stone, excluding marine limestone. Ensure that the aggregate is free from vegetable matter, sand, lumps or balls of clay, or other deleterious matter.
- 2 Ensure minimum weight for crushed slag used in Macadam Base Course, when dry and rodded, is 70 pounds per cubic foot. Use crushed slag that consists of angular fragments, reasonably uniform in density and quality, and reasonably free from glassy, thin or elongated pieces, dirt, or other objectionable material.

305.2.4.3 Coarse Aggregate for Marine Limestone Base Course

- 1 Use coarse aggregate for Marine Limestone Base Course consisting of sound, durable particles of marine limestone aggregate.

305.2.4.4 Coarse Aggregate for Recycled Portland Cement Concrete Base Course

- 1 Use coarse aggregate for Recycled Portland Cement Concrete Base Course consisting of sound, durable particles of recycled Portland cement concrete aggregate, excluding crushed concrete block or pipe.

305.2.5 Fine Aggregate

305.2.5.1 General

- 1 Use fine aggregate or binder material passing the No. 4 sieve subject to the requirements in this subsection.

305.2.5.2 Fine Aggregate for Macadam Base Course

- 1 Use fine aggregate for Macadam Base Course consisting of material produced by crushing operations, excluding marine limestone.

305.2.5.3 Fine Aggregate for Marine Limestone Base Course

- 1 Use fine aggregate for Marine Limestone Base Course consisting of marine limestone produced by mining or crushing operation. Sand will not be permitted as fine aggregate.

305.2.5.4 Fine Aggregate for Recycled Portland Cement Concrete Base Course

- 1 Use fine aggregate for Recycled Portland Cement Concrete Base Course consisting of material produced by the crushing operation, sand, soil, or other acceptable material. Ensure that these materials are obtained from sources approved by the MRE.

305.2.5.5 Composite Mixture

- 1 After the base course material is spread on the subgrade, mixed, and shaped, but prior to the beginning of compaction operations, make certain that the composite mixture conforms to the requirements in the following table.

Macadam Base Course	
Sieve Designation	Percentage by Weight Passing
2-inch	100
1½-inch	95 – 100
1-inch	70 – 100
½-inch	48 – 75
No. 4	30 – 60
No. 30	11 – 30
No. 200*	0 – 12
Liquid Limit	25 Max.
Plasticity Index	6 Max.

Marine Limestone Base Course	
Sieve Designation	Percentage by Weight Passing
2- inch	100
1½-inch	95 – 100
1-inch	70 – 100
½-inch	50 – 85

(table continued on the next page)

(table continued from the previous page)

Marine Limestone Base Course	
Sieve Designation	Percentage by Weight Passing
No. 4	30 – 60
No. 30	17 – 38
No. 200*	0 – 20
Liquid Limit	25 Max.
Plasticity Index	6 Max.

*AASHTO T 11 is used to determine the amount passing the No. 200 sieve.

Recycled Portland Cement Concrete Base Course	
Sieve Designation	Percentage by Weight Passing
2-inch	100
1½-inch	95 - 100
1-inch	70 - 100
½-inch	48 - 75
No. 4	30 - 60
No. 30	11 - 30
No. 200*	0 - 12
Liquid Limit	25 Max.
Plasticity Index	6 Max.

*AASHTO T 11 is used to determine the amount passing the No. 200 sieve.

305.2.5.6 Asphalt Materials

- 1 Use EA-P Special for priming the base course conforming to the requirements specified in **Section 407**.

305.3 Equipment

- 1 Ensure that the equipment necessary for the proper construction of the work is on site, in acceptable working condition, and approved by the RCE as to both type and condition before the start of work under this section. Provide sufficient equipment to enable prosecution of the work in accordance with the project schedule and completion of the work in the specified time.
- 2 Use a steel wheel roller capable of developing a pressure of 250 to 350 pounds per inch of roller width in the compression wheel for compaction. If necessary, use other rollers in conjunction with the steel wheel roller. Ac-

ceptable additional rollers are self-propelled or tractor drawn pneumatic tired rollers or vibratory rollers. Use a combination of the above rollers as necessary to produce a finished product that complies with these specifications.

305.4 Construction

305.4.1 Preparation of Subgrade

- 1 Construct the foundation for the graded aggregate base course in accordance with the requirements as specified in **Section 208**. Roll and compact the subgrade for at least 500 feet ahead of the placing of base course materials where feasible.
- 2 Construct shoulders in accordance with the requirements of **Section 209**, accurately trimmed to the alignment and grade of the base course to form a trench or channeled section as prescribed on the Plans.

305.4.2 Placing of Base Course Material

- 1 Deliver base course materials to the project with the necessary fines already included. Alternatively, add fines if necessary to obtain the desired density and stability. However, in any case provide material whose final gradation meets the requirements shown in **Subsection 305.2.5**.
- 2 Place the base course aggregate on the prepared foundation. Perform the spreading so that the finished base course conforms to the lines, grades, dimensions, and the typical cross-sections shown on the Plans or as directed by the RCE.
- 3 When the required compacted thickness is 10 inches or less, construct the base course in one layer. Where the required thickness is more than 10 inches, construct the base course in two or more layers of approximately equal thickness, and ensure that the maximum compacted thickness of any one layer does not to exceed 10 inches. Construct and compact each layer as specified before placing the succeeding layer.
- 4 Take care to prevent segregation of the fines from the coarse aggregates during the handling, spreading, or shaping of the materials. Correct all areas of segregated fine or coarse material before subsequent placement of overlying lifts.
- 5 If the foundation becomes unstable after the base course has been placed, repair the affected section. Repair the section by removing the base course material and unsatisfactory foundation material and replacing it with approved foundation material. Reconstruct the foundation to the required compaction and shape and then replace the base course at the required cross-section, grade, and compaction.

305.4.3 Compaction, Rolling, and Finishing

- 1 After the base course material is spread, continually machine it with motor graders or other suitable equipment and maintain the required section until the base course is thoroughly compacted. Compact each layer by the use of equipment specified in **Subsection 305.3**. If the foundation becomes unsta-

ble after the base course has been placed, repair the affected section. After removing the base course material and the unsatisfactory foundation material, place suitable subgrade material at the required compaction and shape and then, replace the base course material to the required cross-section, grade and compaction.

- 2 Start rolling the base course at the edge and proceed toward the center, except on superelevated curves where rolling operations proceed from the lower to the upper side. On areas not accessible for the operation of standard rollers, perform compaction using RCE approved rollers. Continue rolling until the layer is satisfactorily compacted for the full width and depth. Wet the base course when necessary. Extend rolling over the edges of each layer of base course materials for a distance of 2 feet on the shoulders. Continue blading and rolling until a dense, smooth, unyielding, and well-bonded base course is obtained.
- 3 If initial compaction has been performed and the voids are not filled, place fine aggregate on the base course in an amount only sufficient to fill the voids. Broom, wet, and roll the base course until the coarse aggregate is firmly set, bonded, and the base course is thoroughly compacted for the full width and depth. Compact each layer of the macadam base course while near optimum moisture with equipment capable of obtaining the required density for the full depth. Continue the rolling until the entire base course is compacted to not less than 100.0% of maximum laboratory density as determined by **SC-T-140**. When the total compacted thickness of the graded aggregate base course is more than 10 inches, place the materials in layers as specified in **Subsection 305.4.2** and compact each layer to the density specified above, regardless of layer thickness.
- 4 Determine the in-place density and moisture content of the graded aggregate base course with a nuclear moisture-density gauge or by other approved means.
- 5 On shoulder work or other applicable construction, do not use steel wheel rollers on the finished pavement, except at locations necessary for turning around. During all phases of the work, take extreme care to protect structures.

305.4.4 Surface Smoothness

- 1 Ensure that the finished surface of the base course varies neither more than $\frac{3}{8}$ inch from a straight edge 10 feet long when applied parallel to the centerline of the road, nor more than $\frac{1}{2}$ inch from the typical cross-section shown on the Plans. Provide necessary materials and perform such corrective work to repair any deviations exceeding the limits given above without additional compensation.

305.4.5 Thickness Tolerance of Base Course

- 1 The thickness of the completed base course is measured at staggered intervals not to exceed 250 feet for two-lane roads. Depth measurements are made by test holes through the base course. Where the base course is less

305.4.5

305.4.6

than the specified thickness by more than ½ inch, correct such areas by scari-fying, adding base course material, and re-compacting as directed by the RCE.

- 2 When the base course is paid for on a square yard basis, any measurement that exceeds the specified thickness by more than ½ inch is considered as the specified thickness plus ½ inch. The average job thickness is the average of the depth measurements. When the average job thickness is less than the specified thickness by more than ¼ inch and payment is by the square yard, an adjusted unit price is used for calculating payment. This adjusted unit price bears the same ratio to the contract unit price bid as the average job thickness bears to the specified thickness.
- 3 When the Contract includes more than one road, each road is considered separately.
- 4 No additional payment over the contract unit price is made for any base course where the average job thickness, determined as provided, exceeds the specified thickness.

305.4.6 Application of Prime Coat

- 1 When hot mix asphalt or an asphalt surface treatment is specified as the subsequent layer on a Graded Aggregate Base Course, apply a prime coat to the base course in accordance with **Subsection 401.4.18**. Before applying the prime coat, repair all irregularities in the base course and ensure that the base course has seasoned sufficiently to permit a uniform penetration and that the RCE has approved the density of the base course. Clean the base course of all mud, dirt, dust, and caked or loose material of any description by brooming, blowing, or other methods to expose the coarse aggregate in the base course.
- 2 When, in the opinion of the RCE, the asphalt material used to prime coat the base course may present a hazard to adjacent properties, the RCE may opt to delete the prime coat from a section of roadway.
- 3 Ensure that the rate of application of the prime coat material conforms to the application rates in the following table.

Base Course Material	Application Rate in Gallons per Square Yard of Asphalt (gal/yd ²)	
	Min.	Max.
Macadam Base Course	0.25	0.30
Marine Limestone Base Course	0.10	0.15
Recycled Portland Cement Concrete Base Course	0.25	0.30

- 4 Perform the application using the methods and requirements prescribed in pertinent portions of **Section 406**.

- 5 When it is necessary to maintain traffic on a road or a section of road before the prime coat has had time to sufficiently dry to prevent pickup, apply sand or some other approved granular material as a cover as directed by the RCE. The cost of furnishing this material and performing this work is included in the price of the base course or other items of work and no direct payment is made.

305.4.7 Weight Tickets

- 1 When the base course is measured by the ton, the requirements set forth in **Subsection 302.4.2** regarding weight tickets apply in all respects.

305.4.8 Maintenance

- 1 Machine the base course as often as is necessary to maintain it smooth and true to grade and cross-section and apply water as required to prevent raveling and keep the base course tightly bound until the prime coat is applied. Repair any defects or damage that develops.

305.5 Measurement

- 1 The quantity for the pay item Graded Aggregate Base Course is measured by the pay unit, either square yard or ton, specified in the Contract.
- 2 When paid by the square yard, the quantity for the pay item Graded Aggregate Base Course (of the required uniform thickness) is the surface area of the base constructed as specified and measured by the square yard (SY) of base course in-place, complete and accepted. The area of base course constructed outside the area designated is disregarded in computing the quantity.
- 3 Base course of variable thickness or base course of thickness for which there is no unit bid price bid is converted to square yards of equivalent area of a base course of a thickness for which there is a contract unit bid price. The conversion is based on the base course whose thickness is nearest to that of the base course without a unit price.
- 4 When paid for by the ton, the quantity for Graded Aggregate Base Course is the weight of the base course constructed as specified, measured by the ton (TON), including water contained in the delivered base course material, weighed on approved scales and actually incorporated in the work, complete and accepted. If a visual inspection indicates excessive moisture in the base course, a deduction is made for the weight of water applied in excess of 2% above optimum moisture as determined by the RCE. The weight of base course constructed outside the area designated, wasted or lost due to the negligence of the Contractor, and applied in excess of the rate specified or directed in writing is disregarded in computing the quantity.

- 5 Measurement of Prime Coat is in accordance with **Subsection 401.5**.

305.6 Payment

- 1 Payment for the accepted quantity of Graded Aggregate Base Course, measured in accordance with **Subsection 305.5**, is determined using the

contract unit price for the item. Payment is full compensation for constructing the graded aggregate base course as specified or directed and includes preparing the foundation, furnishing, hauling, placing, spreading, mixing, adding water, shaping compacting, finishing, applying prime coat, maintenance, reconstruction (if necessary) of the base course, and all other materials, labor, equipment, tools, supplies, maintenance, and incidentals necessary to complete the work in accordance with the Plans, the Specifications, and other terms of the Contract.

- 2 Base course specified on a square yard basis and is deficient in thickness is paid for at the adjusted unit price in accordance with **Subsection 305.4.5**.
- 3 Payment for Prime Coat is in accordance **Subsection 401.6**.
- 4 Payment for each item includes all direct and indirect costs or expenses required to complete the work.
- 5 Pay items under this section include the following:

Item No.	Pay Item	Unit
3050104	Graded Aggregate Base Course (4" Uniform)	SY
3050105	Graded Aggregate Base Course (5" Uniform)	SY
3050106	Graded Aggregate Base Course (6" Uniform)	SY
3050107	Graded Aggregate Base Course (7" Uniform)	SY
3050108	Graded Aggregate Base Course (8" Uniform)	SY
3050110	Graded Aggregate Base Course (10" Uniform)	SY
3050112	Graded Aggregate Base Course (12" Uniform)	SY
3050199	Graded Aggregate Base Course	TON

SECTION 309

ASPHALT BASE COURSE - TYPE C AND D

309.1 Description

- 1 This section contains specifications for the materials, equipment, construction, measurement, and payment for construction of an asphalt base course composed of fine aggregate and asphalt binder, mixed in an approved hot mix asphalt plant, constructed on a prepared subgrade, base course, or other surface, applied with a tack coat when specified, and in conformance with the lines, grades, dimensions, and cross-sections shown on the Plans or as directed by the RCE.

309.2 Materials

309.2.1 Asphalt Binder

- 1 Use asphalt binder that meets the requirements of **Subsection 401.2.1**. Use performance grade PG64-22 unless otherwise specified.

309.2.2 Aggregate

309.2.2.1 General

- 1 Use aggregate material conforming to the requirements of **Subsection 401.2.2**. When Asphalt Base Course Type C is specified, use fine aggregate consisting of screenings as specified herein.

309.2.2.2 Screenings

- 1 In order to determine compliance with the material requirements, the RCE may sample the aggregate at any point before its introduction into the dryer. Obtain aggregate that passes a ½-inch sieve with a minimum of 90% of the material passing the No. 4 sieve.
- 2 At least 30 days before the beginning of any base course work, obtain samples of the aggregate intended for use in the construction of the base course. Use standard sampling methods to obtain these samples. Submit the local material to the OMR. Laboratory analysis and tests will be made to determine the suitability of the aggregate and the percentage of asphalt binder to be used.
- 3 Conduct excavation from pits so that a homogeneous material of uniform appearance is produced. When more than one material is used, keep the materials separated until blended from gates at the cold elevator feeders.

309.2.3 Composition of Mixture

- 1 Combine the constituents of the base course in such proportions so that after mixing, the resultant mixture is homogeneous and all particles are coated with asphalt binder. Use hydrated lime in all base courses as an anti-stripping additive.

- 2 Apply the quantity of asphalt binder to the dry aggregate necessary to provide a complete mixture, compacted in place, and meeting the properties specified in the following table.

Property	Type C	Type D
Asphalt Binder, % of Total Mixture	4.3 – 5.7	3.8 - 5.2
Minimum Stability, lbs.	2500	1500

- 3 The exact percentage of asphalt binder in the mixture is set between the above limits after laboratory tests have been made. The above composition limits are not master ranges of tolerance for asphalt binder content. Permitted tolerance for asphalt binder content is outlined in **Subsection 310.2.4**.
- 4 The RCE may direct that the quantity of asphalt material be increased or decreased from the limits specified above in order to secure a more stable mixture.

309.3 Equipment

- 1 Ensure that the equipment necessary for the proper construction of the work is on site, in acceptable working condition, and approved by the RCE as to both type and condition before the start of work under this section. Provide sufficient equipment to enable prosecution of the work in accordance with the project schedule and completion of the work in the specified time.
- 2 The equipment requirements specified in **Subsection 401.3** also apply to Asphalt Base Course.

309.4 Construction

309.4.1 General

- 1 The construction requirements specified in **Subsection 401.4** apply to Asphalt Base Course, except as modified herein.
- 2 If desired, the material may be placed in one hot bin.
- 3 Perform the compaction of the asphalt base course using any combination of approved rollers while the mixture is still at a temperature that results in maximum density. Under normal conditions, perform the initial rolling with the tandem roller or a vibratory roller with the vibratory mechanism disengaged.

309.4.2 Preparation of Subgrade

- 1 Before placing the asphalt base course, prepare the subgrade in accordance with the requirements specified in **Section 208**.

309.4.3 Thickness Tolerance of Base Course

- 1 Where the Plans require a uniform thickness of the asphalt base course and the Contract provides for payment on a square yard basis, the thickness of the base course is determined from measurements taken of the completed base course at intervals not exceeding 500 feet for two-lane roads. Where the base course is less than the specified thickness by more than ½ inch, cor-

rect such areas by scarifying, adding base material, and re-compacting as directed by the RCE.

- 2 Where the measured thickness exceeds the specified thickness by more than $\frac{1}{2}$ inch, this thickness is considered as the specified thickness plus $\frac{1}{2}$ inch. The average job thickness is the average of the depth measurements determined as specified above. When the average job thickness is less than the specified thickness by more than $\frac{1}{4}$ inch, an adjusted unit price is used for calculating payment. This adjusted price bears the same ratio to the contract unit price bid as the average job thickness of the base course bears to the thickness specified.
- 3 When the project includes more than one road, each road is considered separately.
- 4 No additional payment over the contract unit price is made for any base course where the average thickness, determined as provided, exceeds the specified thickness.

309.4.4 Application of Tack Coat

- 1 When multiple lifts of asphalt base course are required, apply a tack coat conforming to the requirements of **Subsection 401.4.18**. No direct payment is made for the necessary tack coat.

309.5 Measurement

- 1 The quantity for the pay item Asphalt Base Course Type (*C or D*) (of uniform thickness required) is measured by the pay unit called for in the Contract.
- 2 When paid for by the square yard, the quantity for Asphalt Base Course is the surface area of the asphalt base course of uniform thickness measured by the square yard (SY) in-place, complete and accepted. Asphalt base course constructed outside of the area designated is not measured.
- 3 Asphalt base course of variable thickness or base course of thickness for which there is no contract unit bid price is converted to square yards of equivalent area of an asphalt base course of a uniform thickness for which there is a contract unit bid price. The conversion is based on the asphalt base course with the thickness nearest to that of the base course in question.
- 4 When paid for by the ton (TON), Asphalt Base Course is measured in accordance with **Subsection 401.5**.
- 5 When the base course is measured and paid for by the ton, the quantity for Liquid Asphalt Binder is measured by the ton (TON) in accordance with **Subsection 401.5**.
- 6 No measurement is made for the liquid asphalt binder when the asphalt base course is paid on a square yard basis, except when the quantity of asphalt binder is increased or decreased from the limits as specified in **Subsection 309.2.3**. The increase or decrease in asphalt binder used is the difference in tons between the quantity specified in **Subsection 309.2.3** and the quantity actually used in the compacted asphalt base course in accor-

dance with written instructions of the RCE.

- 7 All work and cost incidental to the preparation of the subgrade is included in the item Asphalt Base Course and is not measured for payment, except where such work is indicated on the Plans as Unclassified Excavation, in which case, it is measured and paid for in accordance with **Section 201**.

309.6 Payment

- 1 Payment for the accepted quantity of Asphalt Base Course Type (*C or D*) (of uniform thickness required), measured as provided in **Subsection 309.5**, is determined using the contract unit bid price for the applicable pay item. Payment is full compensation for the construction of the asphalt base course as specified or directed and includes furnishing and clearing and grubbing the material pits; excavating and hauling materials, excluding the asphalt cement in paving mixture; preparing the subgrade; mixing, spreading and compacting the base course materials; applying tack coat (if necessary); and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to satisfactorily complete the work as specified.
- 2 Base course that is deficient in thickness is paid for at the adjusted unit price specified in **Subsection 309.4.3**.
- 3 Payment for Liquid Asphalt Binder PG64-22A is paid in accordance with **Subsection 401.6**.
- 4 Payment for the increase or decrease in the asphalt binder authorized in writing by the RCE and determined as provided in **Sub-section 309.5**, is paid for at the delivered cash price. Payment is not made for asphalt binder used in excess of that authorized in writing by the RCE.
- 5 Payment for each item includes all direct and indirect costs or expenses required to complete the work.
- 6 Pay items under this section include the following:

Item No.	Pay Item	Unit
3091040	Asphalt Base Course Type C (4" Uniform)	SY
3091060	Asphalt Base Course Type C (6" Uniform)	SY
3091100	Asphalt Base Course Type C	TON
3092040	Asphalt Base Course Type D (4" Uniform)	SY
3092060	Asphalt Base Course Type D (6" Uniform)	SY
3092100	Asphalt Base Course Type D	TON

DIVISION 400
ASPHALT PAVEMENTS
SECTION 401

HOT MIXED ASPHALT (HMA) PAVEMENT

401.1 Description

- 1 This section contains specifications for the materials, equipment, construction, measurement, and payment for hot mixed asphalt (HMA) base courses, intermediate courses, and surface courses, regardless of gradation of mineral aggregates or the kind, type, and amount of binder or additives.
- 2 Also included in this section are the operations carried out on new and existing asphalt pavements such as milling, surface planing, and full depth HMA patching of asphalt pavement. These operations are performed to repair deteriorated pavement or segregated pavement, remove wheel ruts and other surface irregularities, and provide or restore the appropriate cross-slope to the pavement indicated in the Plans or as instructed by the RCE. Installation of milled-in rumble strips is also included in this section.

401.2 Materials

401.2.1 Binder and Additives

401.2.1.1 General

- 1 Use binder conforming to all of the requirements of AASHTO M 320 and meeting the performance grading within the following table unless otherwise noted in the Contract. Use binder from sources listed on the most recent edition of *SCDOT Qualified Product List 37*. When required, use polymer modified binder consisting of a neat binder modified with an elastomer polymer producing a binder complying with the requirements of a PG76-22 as specified in AASHTO M 320 with the addition of a maximum phase angle of 75 degrees when testing unaged binder in accordance with AASHTO T 320. Use neat binder meeting the requirements for PG64-22 or PG76-22 consisting of production "straight-run" materials that have not been "air-blown" or blended with acid. Use elastomer polymer consisting of a styrene-butadiene (SB), styrene-butadiene-styrene (SBS), or styrene-butadiene-rubber (SBR). Thoroughly blend the composite materials at the asphalt refinery or terminal before being loaded into the transport vehicle. Use polymer modified binder that is heat and storage stable.

Performance Graded Binder		
Type Facility	Intermediate	Surface
Interstates	PG64-22	PG76-22
Primary and Secondary Routes	PG64-22	PG64-22
Critical Areas	PG76-22	PG76-22

401.2.1.2 Liquid Anti-Stripping Agent

- 1 When permitted and used, use liquid anti-stripping agents (ASA) as an asphalt anti-stripping additive in HMA mixes according to the requirements of **SC-M-402**. Use a liquid ASA that has been blended at the binder supplier's terminal at the percentage recommended by the supplier of the liquid ASA and verified during the SCDOT mix design approval process.

401.2.1.3 Hydrated Lime

- 1 Use hydrated lime as an asphalt anti-stripping additive in HMA mixes according to the requirements of **SC-M-402** unless a liquid ASA is permitted and used in accordance with **Subsection 401.2.1.2**. Use hydrated lime conforming to the requirements of AASHTO M 303, Type 1 from suppliers listed on the most recent edition of *SCDOT Qualified Product List 39*.

401.2.2 Aggregates

401.2.2.1 Mineral Aggregates

- 1 Use mineral aggregate that is composed of fine aggregate or a combination of coarse and fine aggregate. Meet the gradation requirements for coarse and fine aggregates that are specified in the tables entitled Gradation of Coarse Aggregates and Gradation of Fine Aggregates located in the Appendix of these specifications. Blend aggregates through separate bins at the cold elevator feeders and not in the stockpile. Coarse aggregate is defined as the portion of the total aggregate retained on a No. 4 sieve, and fine aggregate is the portion passing a No. 4 sieve. Before Department approval may be given for their individual use, provide fine aggregate, coarse aggregate, and any additives in combination with the specified percentage of binder meeting the requirements of the tests specified. In any mix, use aggregates with a combined effective specific gravity of 2.90 or less. Marine limestone use is restricted for surface and intermediate courses as outlined under **Sections 402 and 403**.

401.2.2.2 Mineral Filler

- 1 Use mineral filler that conforms to the requirements of AASHTO M 17.

401.2.2.3 Fine Aggregates

- 1 Use fine aggregate consisting of sand, stone, slag, gravel, screenings, or a combination of sand and screenings from sources listed on the most recent edition of *SCDOT Qualified Product List 1*. Use fine aggregate that is uni-

formly graded from coarse to fine, is free of lumps of clay, loam, or other foreign matter and does not have a coating of an injurious material. The RCE will sample the stockpiled materials at the plant site to ensure compliance with these requirements.

401.2.2.3.1 Sand

- 1 Use sand consisting of hard, sharp, angular grains of quartz or other durable rock, free from excessive quantities of clay or other deleterious substances, and containing not more than 10.0% total material passing the No. 200 sieve with a maximum of 6.0% clay, except as indicated below. Determine the amount of material passing the No. 200 sieve using **SC-T-5**. Determine the percent of clay using **SC-T-34**. Use sand that is free of clay balls, and if it has any clay contained within it, the clay is uniformly dispersed throughout the material. Excavate, blend, and stockpile the sand so that a uniform product is provided. When sands are blended, one of the sands may contain a maximum of 12.0% minus No. 200 material; however, do not exceed 10.0% total material passing the No. 200 sieve with a maximum of 6.0% clay in the composite blend.

401.2.2.3.2 Screenings

- 1 Use screenings consisting of hard, sharp, angular grains of durable materials produced from stone, slag, or gravel meeting the quality requirements of coarse aggregate under **Subsection 401.2.2.4**. When 15.0% or less screenings are used in a mix, do not use screenings containing more than 35% passing the No. 200 sieve as determined by **SC-T-5**. When more than 15.0% screenings are used in a mix, do not use screenings containing more than 15.0% passing the No. 200 sieve as determined by **SC-T-5**. Do not use screenings containing an excessive amount of flaky, micaceous, or other injurious particles. Use regular screenings having a sand equivalent value greater than 40 as determined by AASHTO T 176. When used, ensure that marine limestone screenings or fines contained in a crusher-run material produced from marine limestone material have a sand equivalent of 28 or greater as determined by AASHTO T 176.

401.2.2.4 Coarse Aggregate

- 1 Use coarse aggregate from sources that appear on the most recent edition of *SCDOT Qualified Product List 2* and are shown as approved for HMA or are otherwise approved by the MRE. Use coarse aggregate consisting of clean, washed, tough, durable particles of crushed stone, gravel, or approved crushed slag free from an excess of soft or laminated pieces, disintegrated particles, and vegetable or other deleterious substances and free from aggregate coated with soil or other objectionable matter. Where slag is used, use dry slag having a weight of not less than 75 pounds per cubic foot.
- 2 Unless otherwise specified in **SC-M-402**, the following aggregate requirements apply. Use crushed stone or gravel having an abrasion loss of not more than 60.0% determined by AASHTO T 96 unless otherwise noted. Use slag that has an abrasion loss of not more than 45.0% as determined by

AASHTO T 96. Use aggregates with not more than 10% flat and elongated particles based on a 5:1 ratio following **SC-T-77**.

- 3 Before use in an HMA mixture, test stockpiled slag for expansion following ASTM D 4792 and use material with an average total volumetric expansion of less than 0.50% at the completion of the curing period. Cure stockpiles not meeting the expansion criterion for an additional 2 months minimum before re-testing.
- 4 When the stockpiled material has been aged and passes the volumetric expansion requirements, provide the AME with a certification stating that the material has been cured according to specifications and an HMA mix design for verification. The AME will assign a stockpile number to the stockpile after reviewing the required certification. Age all steel slag used for mix designs in accordance with this specification.

401.2.2.5 Crusher-Run Material

- 1 When using crusher-run material in HMA, use material produced from areas in the quarry that does not allow the possibility of intrusion of overburden, dirt, sap rock, or any other deleterious material.
- 2 The AME will review for approval the process for manufacturing the crusher-run material and the quality control program for controlling production. Utilize a manufacturing process that ensures that a consistent gradation is maintained. Verify this consistent gradation using quality control tests performed by the producer on a daily basis. Make available to the AME all test results upon request.
- 3 Use coarse aggregate in the crusher-run material that is free of clay coatings or other harmful films. Use fines in the crusher-run that meet the quality requirements specified for screenings, including the sand equivalent requirement. Crusher-run material does not require screening before entering the cold feed bin(s) provided a uniform mixture is being produced. If segregation of the finished mixture is evident, the AME may require the crusher-run material to be screened into a coarse and a fine size before entering the cold feed bin(s).

401.2.2.6 Recycled Asphalt Pavement (RAP)

401.2.2.6.1 General

- 1 Ensure that the RAP meets one of the following categories:
 - Category 1: Milled RAP - asphalt material milled from Interstate, US Highway or Primary routes.
 - Category 2: Production Returns – material generated from plant waste, i.e., start-up / shut down material or Random RAP – crushed and screened material removed from secondary routes, private paving projects and/or plant overruns / rejected loads.

401.2.2.6.2 Stockpile Approval

- 1 Perform extraction tests at a rate of 1 per 1000 tons of RAP, with a minimum of 3 tests per stockpile. Process the RAP in such a manner that all particles pass a 2-inch screen before entering the plant, and are free of foreign matter or other contaminations. RAP particles retained on the 2-inch screen may be re-crushed in a manner that does not result in further degradation of the aggregates. Separate stockpiles of RAP material by categories. Erect and maintain a sign satisfactory to the AME on each stockpile to identify the category. Assure that no deleterious material is allowed in any stockpile.

401.2.2.6.3 Records

- 1 Maintain at the plant site a record system for all RAP stockpiles. Include at a minimum the following:
 - Stockpile identification and a sketch of all stockpile areas at the plant site.
 - RAP category (project, state route, plant waste, rejected loads).
 - Origin, dates milled, and the approximate number of tons in the stockpile.
 - All extraction test results.
- 2 At the plant site, make available to the RCE and AME the RAP stockpile records. The RCE or AME may reject by visual inspection any stockpiles that are not kept clean and free of foreign materials.

401.2.2.6.4 Composition of Recycled Mixture

- 1 Use recycled HMA meeting all applicable requirements contained in the specifications, except as indicated herein. Submit samples of RAP and additives proposed for use in the recycled HMA to the AME at least 30 days prior to the beginning of the work. Submit a minimum of 50 pounds of representative milled/processed material along with the RAP stockpile records and the asphalt mix design approval request on forms approved by the AME.
- 2 If milled material from a project is not available, submit at least 10 cores that are between 6 and 8 inches in diameter, sliced at the proposed milling depth that is representative of the material to be milled. In addition, perform a minimum of 6 extraction tests on cored roadway samples from random locations before submitting an asphalt mix design approval request. Submit extraction test results and cores representing the material to be milled with the asphalt mix design request. Ensure that the number of roadway cores obtained is sufficient to represent the entire length of roadway to be milled taking into consideration the length of the project, changing roadway conditions, etc. Conform all HMA to the job mix formulas approved by the MRE within the tolerance range specified.
- 3 Use a final product with a maximum calculated recovered combined absolute viscosity at 140°F of 8,000 poises as determined by **SC-T-95** and AASHTO T 202.

401.2.2.6.4

401.2.2.6.6

- 4 Do not use softening agents, asphalt modifiers, rejuvenators, or recycling agents. Do not use RAP in any HMA mixture that requires or otherwise uses polymer-modified binder.
- 5 The AME will make random project inspections so that samples of recycled HMA can be obtained for checking the recovered absolute viscosity of the binder. For the maximum absolute viscosity at 140°F of the binder recovered from the field samples, do not exceed 14,000 poises.

401.2.2.6.5 Non-Fractionated RAP

- 1 In addition to the limits below, further limit RAP to 15% maximum when introduced in the hot elevator.
- 2 RAP stockpiles may contain RAP from sources indicated by the category and cannot be replenished once approved.
- 3 When used in HMA, do not exceed the maximum amounts of RAP in mixes shown in the following table.

Type Mix	Maximum % RAP	
	Category 1	Category 2
Surface Type B	10	10
Surface Types CM, C, and D	20	10
Intermediate Type B	15	10
Intermediate Type C	25	10
Asphalt Base Types A & B	30	10

401.2.2.6.6 Fractionated RAP

- 1 Mechanically separate RAP materials into appropriate sizes using a high frequency separation device.
- 2 Provide a QC plan approved by the AME, a fractionation device approved by the AME, and sufficient cold feed bins (one per RAP fractionation size) to handle the fine (passing No. 4 or ¼-inch sieve) and coarse material(s) generated during the fractionation process.
- 3 In addition to the limits in the table below, further limit RAP to 15% maximum when introduced in the hot elevator.
- 4 RAP stockpiles may contain RAP from sources as indicated by the category and may be replenished with RAP from sources of that same category.
- 5 When used in HMA, do not exceed the maximum amounts of RAP in mixes shown in the following table.

Type Mix	Maximum % RAP	
	Category 1	Category 2
Surface Type E Asphalt Base Types C & D	15 *	10 *
Surface Type B	15	10
Surface Types CM, C, and D	20	20
Intermediate Type B	25	10
Intermediate Type C (Binder Type 2)	25	25
Asphalt Base Types A & B	30	30

* Fine RAP only

401.2.2.7 Crushed Glass

- Crushed glass is permitted for use as an aggregate in HMA Aggregate Base Types A and B and Intermediate Type C. When used in these mixes, limit crushed glass to a maximum of 15% by weight of total aggregate. Do not exceed the limits of crushed glass in the following table.

Sieve	% Passing
3/8-inch	100.0
No. 200	8.0 max.

- When the stockpiled material is included in an HMA mix design, present a certification to the AME, along with the mix design for verification, stating that the material meets the required specifications. A stockpile number will be assigned to the stockpile after receiving the proper certification documents

401.2.2.8 Shingles

401.2.2.8.1 General

- Shingles are permitted in HMA Aggregate Base Types A and B, Intermediate Type C, and Surface Types C and D.
- If shingles are used, produce a uniform and reacted asphalt mixture of compatible paving grade binder, quality fine and coarse aggregates, anti-strip additive, and shredded shingles.

401.2.2.8.2 Amount of Shingles in the Mixture

- Limit the amount of the shingles used in each mix in accordance of the job mix formula requirements for that mix. When used, utilize 3% to 8% shingles by the total weight of the aggregate.

401.2.2.8.3 Shredded Shingles

- 1 Utilize shredded shingles that are produced primarily from the processing of shingles at a processing facility or during delivery to a landfill. Use shingles that are produced by ambient temperature grinding processes only. Optionally, use shingles of multiple types from multiple sources if the overall blend of shingles meets the gradation requirements. Ensure that the manufacturer of the roofing shingles has removed all debris such as nails, wood, metal, dirt, large stones, etc. and has rendered the materials to a particle size of less than ½ inch. Provide delivered material 99.7% (by weight) free of any debris.

401.2.2.8.4 Gradation

- 1 Use shingles that meet the requirements in the following table when tested in accordance with AASHTO T 27.

Sieve Size	% Passing
1/2-inch	100.0
No. 4	70.0 – 95.0
No. 100	15.0 max.
No. 200	7.00 max.

- 2 Do not exceed ½ inch for the length of the individual shingle particles. Use shingles that are sufficiently dry to be free flowing and to prevent foaming when blended with the hot binder. Ensure that the shingles are free of all chemicals, oils, or any other hazardous materials (e.g., asbestos). Only accept shredded shingles with a certification from the shingle supplier that the material conforms to these specifications.

401.2.2.8.5 Mix Design

- 1 Use the method of mix design described in **SC-T-80** for the design of HMA containing shingles. After heating the aggregates to the proper temperatures and approximately 1 hour before the addition of the binder, add the proper amount of the shingles (e.g., 8% of total weight of the aggregate or 0.080 x total weight of aggregate), mix thoroughly, and place the mix back in the oven. After approximately an additional 1-hour, add the required amount of the binder and mix. Check the temperature of the mixture to ensure that it has reached the compaction temperature before applying the compactive effort.
- 2 During the mix design verification, approval of the mixture will be based on the calculated absolute viscosity of the mixture. Use material with a recovered absolute viscosity at 140°F less than 12,000 poises as determined by **SC-T-95** and AASHTO T 202.

401.2.2.8.6 Extraction

- 1 Perform the extraction process in accordance with requirements described in these specifications. Follow the testing procedures described in **SC-T-75** to

obtain the binder content of the mixture.

401.2.3 Composition of Mixture

401.2.3.1 Submission of Materials and Job Mix Formula

- 1 Provide all asphalt mix designs for approval by the MRE. Prepare the mix designs in a laboratory approved by the AME following **SC-T-82**. Ensure that technicians designing mixes are certified as a Level 2S, HMA Mix Design Technician. Use a mix with the appropriate materials that complies with all specifications. Prepare mix designs following **SC-T-80** and AASHTO T 312.
- 2 In the job mix formula, indicate a single definite percentage of aggregate passing each required sieve and a single definite percentage of binder contained in the mixture. This percentage of binder is the percentage recovered by **SC-T-64** or **SC-T-75** and does not include any binder that may be absorbed in the aggregates. If an anti-stripping agent or other additives are required, in the job mix formula, indicate the percent of each to be incorporated in the mixture.
- 3 Submit the proposed mix design formula in writing and obtain the approval of MRE for the intended source of materials before starting any work or producing any mixture for acceptance.
- 4 The AME may make adjustments in the submitted job mix formula and if so, will provide advice as to the job mix formula to be used.

401.2.3.2 Gradation Test Method

- 1 Determine the gradation of HMA indicated in **SC-M-400**.

401.2.3.3 Tolerances

- 1 Conform mixtures controlled and accepted according to the standard procedure to the tolerances listed in the table below. Do not use any job mix formula, with or without the tolerances, outside of the master range provided in **SC-M-402** unless otherwise stated.

Sieve Size % Passing	Intermediate Courses	Surface Courses
3/8-inch & larger	± 7.0%	± 7.0%
No. 4	± 6.0%	± 7.0%
No. 8	± 6.0%	± 6.0%
No. 30	± 5.0%	± 5.0%
No. 100	± 4.0%	± 4.0%
No. 200	± 2.0%	± 2.0%

401.2.3.4 Moisture Susceptibility

- 1 Subject all intermediate and surface courses to the indirect tensile strength (ITS) test during the mix design and during actual production of the mix.

Conduct the test in accordance with **SC-T-70**.

- 2 Use intermediate and surface courses with a minimum wet conditioned strength of 65.0 psi and a minimum tensile strength ratio (TSR) of 85.0% during mix design.
- 3 Resubmit the HMA job mix request for mixtures that do not meet the minimum wet conditioned strength or minimum TSR requirements.
- 4 Specimens may be molded in the field anytime during construction to determine the moisture susceptibility of an asphalt mix. Produce HMA having a minimum wet conditioned strength of 60.0 psi and a minimum TSR of 80.0% after plant mixing.

401.2.3.5 Dust to Asphalt Ratio

- 1 Maintain the dust to asphalt ratio for all intermediate and surface courses, except for Surface Type E, in the limits of 0.60 to 1.20. The dust to asphalt ratio is defined as the percentage of material passing the No. 200 sieve divided by the percentage of binder. Determine the total amount passing the No. 200 sieve on mix designs by AASHTO T 11. Determine the amount passing the No. 200 sieve in the field by **SC-T-64**, **SC-T-76**, or **SC-T-92**.

401.2.3.6 Wash Gradations

- 1 Use wash gradations on coarse and fine aggregates to determine the combined blend of aggregates in the total mixture during mix designs. Determine aggregate washed gradations by AASHTO T 11. Submit washed gradations on forms approved by the AME when requesting a job mix formula.

401.2.3.7 Aggregate Selection

- 1 Use a combination of aggregates so that mix adjustments can be readily performed to correct mix design and field problems related to air voids, dust to asphalt ratio, and gradation. Use at least 3 uniformly graded aggregated types to compose an asphalt mix design: fine, intermediate, and coarse aggregates. Do not use less than 8% of any given aggregate type in any mix.

401.2.3.8 Rutting Susceptibility

- 1 HMA used for Interstate and high volume routes will be subjected to the Asphalt Pavement Analyzer (APA) procedure during the mix design process and may be subjected to testing during actual production of the mixture, as deemed necessary by the AME. Perform the testing in accordance with AASHTO TP 63 in a testing laboratory approved by the AME. Fabricate and test 6 cylindrical samples with the interior temperature of the APA set at 64°C. Set the downward force at 100 pounds with the hoses pressurized to 100 psi. Compact each specimen to 4 ±1% air voids. Meet the requirements for the specimen's average rut depth as listed in **SC-M-402**.

401.2.4 Mix and Pavement Samples

- 1 Samples of the HMA in use will be taken and tested as many times daily as deemed necessary by the RCE and the mixture must be maintained uniform

throughout the project within the applicable tolerances.

- 2 Furnish samples of HMA for testing from trucks at the asphalt plant site, trucks at the roadway site, or samples cut from the completed pavement structure. When areas of the pavement are so removed, replace with new HMA and refinish. No additional compensation is allowed for furnishing test samples and replacing the areas with new HMA.

401.2.5 Material for Full Depth Patching

- 1 Select the patch material from the HMA mixes approved for use in the project. Provide patch material that meets all requirements established for those mixes.

401.3 Equipment

401.3.1 General

- 1 The method employed in performing the work and all equipment, plants, machinery, tools, etc., used in handling the materials and performing any part of the work is subject to the approval of the RCE before work is started. The method will be changed or improved as required when found unsatisfactory. Maintain all equipment, tools, machinery, and plants used in a satisfactory working condition. Provide sufficient equipment to enable prosecution of the work in accordance with the project schedule and completion of the work in the specified time.

401.3.2 Mixing Plants

- 1 Use either a batch mixing plant or a drum mixing plant that is designed, equipped and operated so that the weighing, proportioning, and mixing of the materials results in a uniform and satisfactory asphalt mixture meeting the requirements of these specifications. At the plant site, provide sufficient storage space for separate stockpiles, bins, or stalls for each size of aggregate. Keep the different sizes separated until they are delivered, without segregation, by the feeder or feeders to the boot of the cold elevator or elevators in their proper proportions. Maintain the storage yard in a neat and orderly condition with separated stockpiles readily accessible for sampling. Provide separate dry storage of adequate capacity for mineral filler when used. During production of mixes for Department projects, provide full access to the control room and other areas of the plant.
- 2 Use mixing plants of sufficient capacity and that are coordinated to adequately handle the proposed construction. Unless otherwise specified, ensure that mixing plants comply with the requirements contained in **SC-M-401**.
- 3 Ensure that mixing plants for RAP conform to the requirements of **Subsection 401.3.6**.

401.3.3 Hydrated Lime Systems

- 1 Use a lime proportioning system meeting the requirements of **SC-M-401**.

401.3.3

401.3.6.2

- 2 Obtain approval by the AME for all lime systems, including the continuous premixing pugmill, before any mix is produced.

401.3.4 Shingle Blending Equipment

- 1 If a mechanical system is used to add the required amount of shingles to the HMA, utilize a system that is fully integrated with controls for mineral aggregate, binder, and anti-strip additive. During the pre-construction meeting, discuss and determine the system and methods of adding the shingles to the mix. The AME will inspect the system (manual or mechanical) for approval.

401.3.5 Shingle Storage Area and Silos

- 1 Provide a storage area for storing the shredded shingles that is kept free and clear of all debris such as dirt, wood, paper, stones, etc.
- 2 If the mixture is discharged from the mixer into a hot mix surge or storage silo, operate the bin so that segregation of the mixture is minimized and mixture is not stored overnight.

401.3.6 Mixing Plants for Recycled Asphalt Pavement (RAP)

401.3.6.1 General

- 1 Produce the recycled HMA in a batch plant or drum mix plant meeting all applicable requirements of the specifications and that is modified in a manner satisfactory to the AME to accomplish the hot recycling process. Ensure that the plant is capable of producing uniform mixtures meeting the requirements in **Subsection 401.2.2.6** at the temperatures specified.
- 2 Use a plant capable of meeting all applicable local, state, and federal pollution control requirements. Be familiar with all regulations and be aware that plant emissions resulting from the recycling process may be monitored.

401.3.6.2 Batch Plants for RAP

- 1 Introduce RAP into the plant at the hot elevator or in the weigh hopper.
- 2 When RAP is introduced into the weigh hopper, accurately weigh and proportion the RAP using an automatic proportioning system. Ensure that the RAP weight tolerance is $\pm 1.5\%$ of the total batch weight. Print the RAP weight for each batch on the weight ticket along with the weight of the other batched materials.
- 3 In addition to the maximum limits in the tables provided in **Subsection 401.2.2.6**, further limit the amount of RAP to 15% maximum when RAP is introduced in the hot elevator. Continuously weigh, control, and monitor the RAP cold feed rate and virgin aggregate cold feed rate. Ensure that the weighing system is accurate to 0.5%. Provide a means for conveniently diverting RAP and virgin aggregates into trucks or other containers for checking the accuracy of the cold feed delivery systems. Calibrate the plant before starting production.

- 4 Make provisions electronically for introducing the determined moisture content of the cold feed materials (RAP and virgin aggregates) in the belt weighing system and automatically correcting wet material weights to dry material weights. Determine the moisture content of the RAP and virgin aggregates twice a day during production or when the AME deems necessary. Record the moisture test results on the daily plant report.
- 5 Equip the hot elevator RAP introduction systems so that the dry RAP and dry virgin aggregate rates, in tons per hour, are printed on a cold feed ticket at a time interval prescribed by the AME. Submit the cold feed tickets to the RCE at the end of each day's production.

401.3.6.3 Drum Mixing Plants for RAP

- 1 Continuously weigh, control, and monitor the interlocked RAP cold feed rate and virgin aggregate cold feed rate. Utilize a weighing system with an accuracy of 0.5%. Provide a means for conveniently diverting RAP and virgin aggregates into trucks or other containers for checking the accuracy of the cold feed delivery systems. Calibrate the plant before starting production.
- 2 Make provisions to electronically introduce the determined moisture content of the cold feed materials (RAP and virgin aggregates) in the belt weighing systems and automatically correct wet material weights to dry material weights. Determine the moisture content of the RAP and virgin aggregates twice a day during production or when the AME deems necessary. Record the moisture test results on the approved daily plant report.
- 3 Introduce the RAP in the plant at a location far enough down-stream from the burner away from the flame and extremely hot gases.
- 4 Equip the drum mixing plant with a printer to print the following plant information:
 - Dry virgin aggregate rate in tons per hour.
 - Dry RAP rate in tons per hour.
 - Binder in tons per hour.
 - Total virgin aggregates, RAP, and binder in tons per hour.
- 5 Print the above mentioned plant information on a ticket at a time interval prescribed by the AME. Submit the plant information tickets to the RCE at the end of each day's production.

401.3.7 Hauling Equipment

- 1 Use trucks for hauling asphalt mixture that have tight, clean, smooth metal beds and, to prevent the mixture from adhering to the bed, have been thinly coated with an asphalt release agent listed on the most recent edition of *SCDOT Qualified Product List 17*. Do not use petroleum-based products to prevent asphalt mixtures from adhering to the beds. In all cases, after spraying with solution, raise truck beds so that excess material drains before placing mixture in the truck. Place a hole at a suitable location in the truck bed for checking the temperature of the mixture. Provide and have installed on vehi-

cles a cover made of canvas or suitable material that provides an essentially weather-tight enclosure to completely cover and protect the mixture from inclement weather or where there is evidence of a crust forming. Do not use mesh tarps for covers.

401.3.8 Batch and Truck Scales

- 1 Provide truck scales at the plant site to obtain the net weight of each load of finished mixture and that meet the requirements of **SC-M-401**.

401.3.9 Silos for Storage of HMA

- 1 Ensure that silos used for storage of HMA conform to the requirements of **SC-M-401**.

401.3.10 Pavers

- 1 Unless otherwise permitted or directed by the RCE, spread the asphalt mixture by means of a mechanical self-powered paver capable of spreading and finishing the asphalt mixture without segregation to the depth and width required, true to line, grade, and crown set by the RCE. Equip the paver with hoppers and distributing screws or satisfactory devices for placing the mixture uniformly in front of the screed. When extendable screeds are used, sufficiently extend the distributing screws or augers to provide uniform distribution of the mixture for the full width of the screed. Use a screed or strike-off assembly that operates by cutting, crowding, or other practical action that is effective on the mixture at workable temperatures without tearing, shoving, or gouging and that produces a finished surface of the smoothness and texture required. Use a screed that is adjustable as to level and has an indicating level attached.
- 2 Use a paver that is capable of operating at variable speeds consistent with uniform and continuous laying of the mixture. Avoid stop and go operations of the paver.
- 3 On projects of sufficient length, in addition to the above requirements, equip the paver with a system for automatically controlling the pavement cross-slope and for automatically controlling the longitudinal profile. As the paver moves forward, ensure that the system causes the paver to automatically anticipate and make adjustments for undulations encountered on the existing surface.
- 4 Attach to the paver a 40-foot mobile stringline, a 40-foot long ski, or an approved electronic leveling device with the mobile stringline or ski reference used to establish the longitudinal profile. Use a grade-following sensor that is capable of following the taut string, wire, or other reasonable rigid grade reference produced by the leveling device. Use an automatic cross-slope device that is adjustable and is able to obtain the proper super-elevation going into curves and able to maintain the maximum super-elevation within curves once reaching the maximum super-elevation. For tying into an existing layer of material, use the existing material as the grade reference for the grade following sensor.

- 5 If desired, use manual operation for constructing irregularly shaped and minor areas. If the automatic controls fail or malfunction, the equipment may be operated manually for the remainder of the normal working day, provided specified results are obtained. If the specified surface tolerance is not obtained and maintained, suspend the paving operations until satisfactory corrections, repairs, or equipment replacements are made.

401.3.11 Rollers

401.3.11.1 General

- 1 At the job site, provide the RCE with the manufacturer's literature for the rollers being used, in order that the RCE can determine that the rollers conform to the specifications. Check the tire pressure in the pneumatic-tired rollers upon request and without additional compensation. Check the weight of any roller in use in the presence of the RCE.
- 2 Maintain roller speeds that give maximum compaction and a smooth pavement.

401.3.11.2 Steel-Wheel Rollers

- 1 Use steel wheel rollers that are between 8 and 12 tons in weight. Develop a minimum pressure of 250 pounds per inch of roller width in the compression wheel for these rollers under working conditions. Use rollers in good working condition and capable of reversing without backlash. Equip rollers with adjustable scrapers to keep the rollers clean and with efficient means of keeping the wheels wet to prevent mixes from sticking to the rollers.
- 2 Keep the surface of the rollers free of flat areas, openings, or projections that could mar the surface of the pavement.

401.3.11.3 Pneumatic-Tire Rollers

- 1 Use pneumatic-tire rollers that are self-propelled and have an effective rolling width of not less than 60 inches. Equip the rollers with pneumatic tires of equal size and diameter that are capable of exerting uniform contact pressures. Pressures varying from 60 psi to 80 psi are recommended. Adjust contact pressure by adjusting the ballast or tire inflation pressures. Place the wheels of the rollers so that one pass accomplishes complete coverage equal to the rolling width of the machine. Ensure a minimum of a ¼-inch overlap of the tracking wheels and ensure that the wheels do not wobble. Construct the roller so that the contact pressure is uniform for all wheels, and the tire pressure of the several tires does not vary more than 5 pounds per square inch. Use pneumatic-tire rollers that are constructed with enough ballast space to provide the uniform wheel loading required. Vary the total operating weight and tire pressure of the roller directed by the RCE to obtain contact pressures that results in adequate compaction.

401.3.11.4 Vibratory Rollers

- 1 Use vibratory rollers that weigh at least 8 tons and have either 1 or 2 vibrating wheels. Operate the roller at a speed, frequency, and amplitude that

yields maximum compaction and a smooth pavement.

401.3.12 Field Laboratory and Equipment

- 1 Provide and maintain in good condition a fully equipped field laboratory, meeting the requirements of **SC-T-81** and furnish all supplies necessary for performing the quality control inspection and testing at the asphalt plant. Furnish all the necessary electricity, fuel, and gas and furnish and maintain all necessary piping and valves. Provide full and ready access for the RCE and MRE during all production and testing. Make immediately available all records to the RCE and MRE at the asphalt plant upon request. Permit the RCE and AME to perform quality control or other tests as deemed necessary. Provide a substantial platform, constructed to the proper height, for use by the RCE and AME in obtaining HMA samples and inspecting mixtures in truck beds. All testing equipment and supplies will be inspected for approval by the AME.

401.3.13 Cutting Equipment for Milled-In Rumble Strips (MIRS)

- 1 Use a rotary type cutting head for MIRS. Use a head with a maximum outside diameter of 24 inches and a minimum length of 16 inches. Equip the cutting head with the cutting tips arranged in such a pattern that provide a relatively smooth cut. Ensure that the cutting head(s) is mounted on its own independent suspension from that of the power unit to allow the tool to self-align with the slope of the shoulder and/or any irregularities in the shoulder surface. Equip the cutting tool with guides to provide consistent alignment of each cut in relation to the roadway and provide uniformity and consistency throughout the project.

401.3.14 Equipment for Milling Existing Asphalt Pavement

- 1 Use a milling machine capable of performing the work to the specified width, depth, and cross-slope as shown in the Plans or as directed by the RCE.

401.3.15 Equipment for Planing Existing Asphalt Pavement

- 1 Use a planing or milling machine equipped with a cutting mandrel with carbide-tipped cutting teeth designed specifically for planing asphalt pavement to close tolerances. Make certain that the equipment accurately establishes slope elevations and profile grade controls. Ensure that a vacuum-equipped street sweeper, capable of removing all loose material from the roadway without causing dust to escape into the air, follows immediately behind the grinding machine. Provide necessary vehicles and equipment for loading and hauling away milled material and cleaning the road surface after planing.

401.4 Construction

401.4.1 General

- 1 Construct the base, intermediate, or surface course consisting of one or more courses of binder coated mineral aggregates on the prepared surface in accordance with these specifications and the specific requirements of the type

401.4.1

401.4.5.2

specified. Conform the courses to the required lines, dimensions, thickness, and typical cross-section or specified rate of application.

- 2 Conform the production, spreading, compaction, etc. to the applicable requirements of the Specifications.

401.4.2 Plant Production

- 1 Conform HMA production to the requirements of **SC-M-400** unless otherwise specified.
- 2 If it is believed that the HMA is not accurately represented by the field laboratory results, the RCE may contact the AME to investigate the mixture. This investigation may involve the testing of additional HMA material from the paver, delivery truck, or roadway cores.

401.4.3 Paving from Multiple Plants

- 1 To avoid intermixing HMA, do not pave the same lane using mix from more than one plant during a day's production.

401.4.4 Weather and Surface Temperature Restrictions

- 1 Do not apply HMA when the existing surface is wet or frozen. Place HMA in accordance with the following table.

Lift Thickness (inches)	Minimum Ambient Temperature (°F)*
1.0 or less	55.0
1.1 to 2.0	45.0
2.1 to 3.0	40.0
3.1 to 4.5	35.0
* Measure ambient air temperature in the shade with a calibrated thermometer away from artificial heat following SC-T-84 .	

- 2 Do not place HMA surface courses, including Surface Type E, during the months of December, January, and February, except with written permission of the DOC.

401.4.5 Plant Calibration

401.4.5.1 General

- 1 Calibrate the asphalt plant before production so that the mix conforms to the job mix formula and field criteria. Keep stockpile aggregate gradation test results and calibration charts or graphs immediately available to the RCE at the plant upon request.

401.4.5.2 Batch Plant

- 1 When a batch plant is used, calibrate the cold feed bins to the correct proportions on the job mix information sheet. Develop calibration charts or

graphs for each individual cold feed bin. Sample each hot bin and perform gradation tests on each hot bin sample. Determine the percentage of material weighed from each hot bin. Immediately correct the automatic proportioning system when it does not consistently deliver materials within the full range of batch sizes within the tolerances stated in **SC-M-401**. Ensure that the automatic proportioning system can be corrected when the binder content does not reasonably compare with the extraction test results.

401.4.5.3 Drum Mixer Plants

- 1 When a drum mixer plant is used, calibrate the cold feed bins to the correct proportions on the job mix information sheet. Develop calibration charts or graphs for each individual cold feed bin. Recalibrate binder systems when there is variance in the binder content or when the RCE deems necessary. Determine the moisture content of the aggregates before entering the drum at least two times a day or when the RCE or AME deems necessary. Keep calibration charts or graphs and aggregate moisture content test results immediately available to the RCE and AME in the field laboratory upon request.

401.4.5.4 Contractors Monitoring Operations

- 1 Monitor the gradation and quality of materials that are delivered to the asphalt plant. When one or more aggregate gradations do not reasonably conform to the gradation on the job mix information sheet, resubmit another job mix design request.

401.4.5.5 Failing Samples

- 1 Adjust plant production and address samples that are out of tolerance as indicated in **SC-M-400**.

401.4.6 Use of HMA Stored in Silos and Surge Bins

- 1 Ensure that storage of HMA in silos is conducted following the requirements stated in **SC-M-401**.
- 2 The RCE is not obligated to purchase any HMA stored in a silo or surge bin that does not comply with the job mix formula and/or mixture field criteria. HMA that the RCE determines is segregated or contains too much binder due to migration will be rejected.

401.4.7 Preparation of Binder

- 1 Heat the binder to a temperature range recommended by the binder supplier in tanks designed to provide uniform heating of the entire content and to provide a continuous supply of the binder to the mixer at a uniform temperature. Do not heat the unmodified binder to more than 325°F or greater than the temperature recommended by the binder supplier at any time before or after shipment to the plant site.

401.4.8 Preparation of Aggregate

- 1 At the plant, dry and heat the aggregate for the mixture. Heat the aggregate to a temperature between 250°F and 325°F or within the temperature

range recommended by the binder supplier.

401.4.9 Preparation of Mixture

- 1 Heat and prepare the ingredients in a manner that produces a mixture that, when discharged, is at a temperature recommended by the binder supplier, except for HMA Base Type C and D, which requires a temperature to provide complete coating of all particles (typically 240°F to 275°F).
- 2 Whenever possible, devote the full production of the plant to the project in order that the work is performed as continuously as practical. Do not intermix different job mixes in a silo.

401.4.10 Mixing: Batch, Drum, and Continuous Mix Plants

- 1 In order to give the correct individual proportions, follow the HMA job mix formula at all asphalt plants. Dry the aggregates to a consistent mixing temperature before introducing the binder into the HMA. Mix the correct proportions of aggregate, mineral filler, lime, and binder to produce a homogenous asphalt mix in which all particles are thoroughly coated. Use asphalt plants meeting **SC-M-401**, with lime systems checked initially by the AME before producing HMA for Department projects. Use a plant that is able to produce a consistent asphalt mix, without problems with segregation, mix temperature, and varying binder content to meet requirements of the Specifications.

401.4.11 Blending of Hydrated Lime

- 1 Uniformly blend hydrated lime with the damp aggregate at a rate of 1% by weight of dry aggregate. Use damp aggregate containing a minimum of 3% moisture. Use a water spray delivery system if aggregate moisture is less than 3% or when the RCE deems it necessary to prevent lime from becoming airborne. Adjust the production rate so that there is not any retained moisture in the finished mix.
- 2 Perform aggregate moisture tests at least two times a day or when deemed necessary by the RCE. Obtain the aggregate moisture samples at a location between the water spray delivery system and the lime feed system. Keep a record of the test results in an easily accessible location at the asphalt plant for review by the RCE and MRE.
- 3 Determine the percentage of hydrated lime being introduced into the HMA in accordance with **SC-T-71** or **SC-T-78**. Check the percentage of hydrated lime at least two times a day or when the RCE deems necessary. Additionally, when **SC-T-78** is used, verify the weighing system accuracy at least one time per week or as often as the RCE deems necessary.
- 4 Maintain a daily record of aggregate moisture tests and lime percentage determinations on a form approved by the AME. Maintain the amount of hydrated lime by dry aggregate weight in the range of 0.90% to 1.10%. Upon request, make all records immediately available to Department personnel at the asphalt plant.

401.4.12 Milling Existing Asphalt Pavement

- 1 Mill the existing asphalt pavement to the specified width, depth, and cross-slope at locations shown on the Plans or as directed by the RCE. Monitor the milled surface to ensure smoothness and to reduce excess scarification marks or other damage as determined by the RCE. Establish the longitudinal profile of the milled surface by using a skid sensor on the side of the cut. Dispose of the milled material. Thoroughly clean the milled surface of all loose particles.
- 2 Tie milled surfaces to existing drives and intersections. Conduct additional milling in these areas as necessary.

401.4.13 Planing Existing Asphalt Surfaces

- 1 Conduct planing operations in a manner that produces a uniform finished surface of the required texture, grade, and cross-slope. Conduct planing operations in a continuous manner to ensure uniformity. It is not acceptable to conduct frequent halting of the planing operations to load and unload trucks.
- 2 Substantially plane and texture all of the surface area indicated. Extra planing to eliminate small depressed areas is not required if the cumulative total of these un-textured areas does not exceed 5% of the total treated area. It is critical that the planed surface does not allow water to accumulate at the edges of the pavement. Extend planing operations into the paved shoulders or other adjacent pavement a sufficient distance to prevent the construction of a "lip" or other area that retains water on the roadway surface.
- 3 Before commencing work, construct a test section of at least 500 feet in length. The purpose of the test section is to determine the appropriate forward speed for the planing equipment and to demonstrate that the equipment is providing a surface texture, cross-slope, and lane/shoulder configuration satisfactory to the RCE and consistent with this specification.
- 4 Create a "corduroy" texture consisting of a transverse pattern with grooves spaced no greater than 0.2 inches center to center and running generally parallel to the pavement centerline. Ensure that the maximum depth from high to low points on the planed surface is $\frac{1}{8}$ inch.
- 5 After completion of the planing process, test the ground pavement surface transversely and longitudinally with a 10-foot straightedge. Conduct the straightedge testing at no additional cost to the Department. Conduct testing parallel and normal to the pavement centerline. The RCE will determine the minimum frequency of testing and may require additional testing. Perform additional planing at no additional expense to the Department on all areas with high or low spots in excess of $\frac{1}{8}$ inch or in areas where the RCE determines that the appropriate cross slope and grades are not met.
- 6 Before allowing traffic on the planed pavement, clean the pavement of dust and debris using appropriate equipment. Use a vacuum sweeper if instructed to do so by the RCE.

401.4.14 Removal of Existing Asphalt Pavement before Patching

- 1 Remove the deteriorated pavement to the width and length as determined by the RCE, with the face of the cut being straight and vertical. Construct patches with a minimum patch size of 6 feet X 6 feet with at least 25 feet between patches. Remove the pavement to the depth indicated in the Plans. If unstable material is encountered at this point, remove additional material as directed by the RCE. Backfill the volume of material removed below the patch with material meeting the requirements of **Section 305**, Graded Aggregate Base and thoroughly compact in layers not exceeding 4 inches with vibratory compactors. Thoroughly tack the sides of the existing asphalt pavement before placing the asphalt patch material in the hole. Place the patch material in layers not exceeding 3 inches. Thoroughly compact each layer with a vibratory compactor and pneumatic roller. Conduct the work so that patches are opened and filled the same day, with the roadway being opened to traffic by late that same day. Ensure that the finished patch is smooth riding. Do not apply asphalt mixture when the existing surface is wet or frozen.

401.4.15 Conditioning of Subgrade

- 1 Before placing any HMA base course mixture, prepare the subgrade in accordance with the requirements specified in **Section 208**.

401.4.16 Surface Preparation and Leveling

- 1 Prepare base courses as specified in the applicable sections of Division 300.
- 2 Thoroughly sweep the base course, old pavement, or existing surface so that it is clean and free from dust and foreign material. Maintain it until the HMA is placed.
- 3 Bring irregularities in the surface of the existing pavement or old base (including widened shoulders where settled) to uniform contour by leveling with HMA. Place the leveling HMA in a separate operation from the specified depth of surface course. Thoroughly compact the leveling HMA until it conforms to the surrounding surface. Where necessary, perform the leveling with a motor grader or paver.

401.4.17 Transportation and Delivery of Mixes

- 1 Transport the HMA from the plant to the point of use in vehicles meeting the requirements of **Subsection 401.3.7**. Do not permit any load of HMA to leave the plant so late in the day that it cannot be spread, finished, and compacted during daylight of that same day unless an approved artificial lighting system is provided.
- 2 Deliver the HMA to the spreader at a temperature within 20°F of the temperature set at the plant.

401.4.18 Application of Prime or Tack Coat

- 1 Where the Plans call for HMA to be placed directly on a sand clay base course, coquina shell base, or graded aggregate base course and the priming of which is not otherwise provided, apply a prime coat meeting the requirements of **Section 303, 304, 305, or 306** as applicable. A prime coat is not required when HMA is placed directly on the subgrade.
- 2 Before laying any HMA on existing pavements or on unsealed asphalt surface treatment course, uniformly apply a tack coat by use of the distributor spray bars at the rate of 0.05 to 0.15 gallons per square yard as measured by **SC-T-86**. Ensure that all nozzles on the distributor are fully open and operational and are turned at the same angle to the spray bar, which is approximately 30 degrees. In addition, place the spray bar at the proper height above the pavement and apply the proper pressure to provide a uniform double or triple lap of the liquid asphalt material. Place lesser amounts on new pavements and greater amounts on older pavements to ensure a bond between the surface being paved and the overlying course. In areas where it is impractical to use distributor spray bars, such as crossovers, small areas, etc., it is permissible to apply the material by the use of the handheld nozzle. In both cases, apply the actual rate of application as directed by the RCE. Provide a tack coat consisting of binder or emulsified asphalt from a supplier listed on the most recent edition of *SCDOT Qualified Product List 37 or 38*. The acceptable grades of emulsified asphalt are RS-1, MS-1, MS-2, HFMS-1, HFMS-2, SS-1, CRS-1, CRS-2, CMS-2, and CSS-1. Emulsified asphalt, with the exception of grades RS-1 and CRS-1, may be diluted with up to 50% with water provided the dilution is performed at the manufacturing plant by the manufacturer using acceptable procedures. Do not dilute any of the emulsions at the point of use.
- 3 In all cases, regardless of the type tack material used, ensure that the existing pavement or unsealed asphalt surface treatment course is dry and thoroughly cleaned before applying the tack material.
- 4 When HMA sand base course is constructed in layers, clean and scarify the compacted layer as directed by the RCE before placing the next successive layer. When considered necessary by the RCE, apply a tack coat between layers as stipulated above.
- 5 Coat contact surfaces of headers, curbs, gutters, edges of existing pavement, manholes, catch basins, etc. with a thin uniform coating of asphalt tack coat material just before the HMA is placed against them.
- 6 Apply the tack coat as outlined above in a sufficient length of time in advance of the laying of the HMA to permit drying but not so far in advance or over such an area to cause it to lose its adhesiveness.
- 7 No additional compensation is provided for furnishing and applying the tack coats as specified in this subsection.

401.4.19 Spreading and Finishing

- 1 Upon arrival at the point of use, dump the HMA into the mechanical spreader and immediately spread and strike off true to the line, grade, and cross-section stipulated and to such appropriate loose depth for each successive course that when the work is completed, the specified thickness or weight per square yard is achieved. Determine HMA placement rates using **SC-T-85**. Deliver and spread all HMA while in a thoroughly workable condition and free from lumps. Handle material in such a manner to reduce segregation. Dump the HMA in the center of the hoppers and take care to avoid overloading and spilling material on the base.
- 2 If during construction it is found that the spreading and finishing equipment leaves tracks or indented areas in the new course that are not satisfactorily corrected by the scheduled operations, or which produce other permanent blemishes, discontinue the use of such equipment and provide other satisfactory spreading and finishing equipment.
- 3 Provide competent personnel who are capable of performing the work for the correction of all pavement irregularities. Correct irregularities in HMA courses while the mixture is still hot. Give special attention to the straight edging of construction joints immediately following the final rolling. Provide a qualified employee to perform the straight edging.
- 4 Immediately after a course is placed and before roller compaction is started, check the surface and adjust any inequalities. Remove all fat spots and irregular areas and replace them with satisfactory material. Correct irregularities in alignment and grade along the outside edge by the addition or removal of HMA before the edge is rolled.
- 5 Unless otherwise directed by the RCE, do not allow the compacted thickness of any single constructed course to exceed the following thicknesses:
 - 4½ inches for HMA Aggregate Base Course,
 - 3 inches for HMA Sand Base Course,
 - 3 inches for HMA Intermediate Course, or
 - 2 inches for HMA Surface Course.
- 6 Place each layer to such thickness as instructed by the RCE. Overlap the joints in the layers a minimum of 6 inches where practical.
- 7 When multiple lifts are being placed in a single day, ensure that the interior mat temperature of the previous lift is less than 175°F when measured at the mid-point of the depth of mat with a calibrated thermometer following **SC-T-84**.
- 8 If desired, in ditch paving, narrow widening, deep or irregular sections, intersections, turnouts, driveways, or at other locations where it is impractical to spread and finish the HMA by standard methods, use approved spreading equipment or acceptable hand methods. When it is considered necessary to improve the profile and cross-section of an existing pavement before placing the additional normal layer of HMA, the RCE may require that the material be

spread with a blade grader or other type of construction equipment that will give the desired results. Do not dump the loads faster than the material can be properly handled. Perform the raking carefully and skillfully to avoid segregation and so that after the first pass of the roller over the raked HMA, minimal back-patching is required.

- 9 Provide approved means for keeping all small tools clean and free from accumulations of asphalt material.
- 10 Locate the finished surface of surface courses placed adjacent to curbs, gutter, manholes, etc., approximately ¼ inch above the edges of these structures.

401.4.20 Compaction (Standard)

- 1 Ensure that compaction is obtained following the requirements stated in **SC-M-400**.
- 2 Ensure that the intermediate rolling is completed before the mat temperature drops below 175°F.
- 3 To prevent adhesion of HMA to the steel-wheel roller, keep the wheels moistened, without using excess water. Do not use oil.
- 4 In areas such as ditches or along forms, curbs, headers, and walls not accessible for the operation of rollers as specified herein, perform compaction with hand or mechanical tampers, hand-drawn steel wheel rollers, or self-propelled tandem steel wheel rollers as directed by the RCE.
- 5 Ensure that the surface of the HMA after compaction is smooth and true to the established crown and grade. Remove any mixture that becomes loose and broken, mixed with dirt, or in any way defective and replace it with fresh HMA. Immediately compact the fresh HMA to conform to the surrounding area.

401.4.21 Compaction Monitoring

- 1 Monitor the compaction process and make adjustments in equipment or roller patterns so that the finished HMA pavement meets the specified in-place density requirement. Conduct in-place density tests at least every 500 feet per paving lane width by conducting density-gauge tests at randomly selected locations approved by the RCE and at least 1 foot from any unsupported edge. Determine randomly selected locations by **SC-T-101**.
- 2 Do not start production in a lot until the roadway cores from the previous day's production have been obtained unless permission is given by the RCE. Obtain all density tests and cores required for compaction determination using equipment and procedures approved by the RCE.

401.4.22 Weak Base or Poor Surface Conditions

- 1 If in the judgment of the RCE a weak base or poor surface condition results in a density lower than the minimum specified, the RCE may establish a "maximum practical density" lower than that specified.

401.4.23 Joints

- 1 Roll longitudinal joints directly behind the paver. Position the paver so that in spreading, the material overlaps the edge of the lane previously placed by 1 to 2 inches. Leave the loose material high enough to allow for compaction to the depth of the previously rolled lane. Push back the overlapped material by means of lutes or other suitable tools to the edge of the "cold" joint. Perform this work in a manner that provides a uniform joint when rolled.
- 2 Carefully construct and thoroughly compact transverse joints to provide a smooth riding surface. Straightedge or stringline joints to ensure true alignments.
- 3 Construct longitudinal and transverse joints in a careful manner and present the same texture, density, and smoothness as other sections of the course.
- 4 Make joints between old and new pavements, or between successive strips, in a manner that ensures proper bond between the old and new surface for the full depth of the course. Thoroughly coat the joints, transverse and longitudinal, with an approved asphalt tack coat material before placing adjacent material. If necessary, form joints by cutting back on the course. Include the cost of cutting back and coating joints in the contract unit price for the HMA.
- 5 On projects containing multiple courses, arrange the width of the lanes so that the longitudinal joints of each successive course are offset from the joints of the previous course at least 6 inches where practicable. Construct the width of each lane in the top layer the same as the width of the design travel lanes, unless directed otherwise by the RCE.

401.4.24 Milled-in Rumble Strips (MIRS)

- 1 If MIRS are called for in the Plans, place them in the mainline paved shoulder only. Do not place MIRS on ramp shoulders.
- 2 Construct MIRS with finished dimensions of 7 inches ($\pm \frac{1}{2}$ inch) wide in the direction of travel and a minimum of 16 inches long measured perpendicular to the direction of travel. Construct the depressions with a concave circular shape with a minimum $\frac{1}{2}$ -inch depth at center. Place the MIRS perpendicular to the roadway on 12-inch centers. Begin the MIRS on the shoulder, 10 inches from the right edge of the travelway.
- 3 Do not construct MIRS on the median paved shoulder unless specified in the Plans. If the median shoulder is specified, construct the milled area 4 inches from the left edge of the travelway on the shoulder.
- 4 If desired, use removed pavement material suitable for recycling on the project or for other operations at no additional expense to the Department.
- 5 At the end of each working day, remove all equipment to a location where it does not present a hazard to traffic. Clean the pavement by sweeping or flushing; and reopen the work area to traffic each day.

401.4.25 Requirements for Recycled Asphalt Pavement (RAP)

- 1 Conform the production, spreading, compaction, etc. of the RAP to the applicable requirements of the **Subsection 401.3.6**.

401.4.26 Protection of Surface

- 1 Protect the newly constructed surface from traffic until the mixture has hardened sufficiently to prevent distortion. Keep the surface clean and free from foreign material when the shoulders are being constructed.

401.4.27 Finished Surface Requirements**401.4.27.1 General**

- 1 After compaction, ensure that the finished surface of the intermediate or surface course is smooth, of uniform texture, and true to the specified crown and grade.

401.4.27.2 Variability

- 1 When checked with a 10-foot straightedge applied parallel to the centerline of the pavement, ensure that the finished surface of the intermediate course does not vary more than $\frac{1}{4}$ inch and the finished surface course does not vary more than $\frac{1}{8}$ inch as measured from the bottom of the straightedge to the top of the finished surface. Correct intermediate or surface courses not meeting these finished surface requirements by repairing or if necessary, by removing and replacing subject to the approval of the RCE.

401.4.27.3 Ride Quality

- 1 In addition to meeting any specified requirements for surface tolerances, ensure that the intermediate and surface courses meet the satisfactory riding qualities for the HMA placed as determined by the RCE.

401.4.28 Segregation Identification and Correction

- 1 Segregation is defined as areas of non-uniform distribution of coarse and fine aggregate particles in a compacted HMA pavement.
- 2 Conduct necessary production, storage, loading, placing, and handling procedures to prevent segregation. Prevent placement of a segregated HMA mat by making plant modifications or providing auxiliary equipment.
- 4 Correct segregated areas in HMA courses at no additional expense to the Department. Meet all compaction and rideability requirements on roads with corrected segregated areas.
- 5 Correct segregated HMA courses that are not considered riding courses by removing and replacing segregated areas for the full depth of the course and extend at least 10 feet on either side of the segregated areas for the full width of the paving lane.
- 6 Correct all segregated HMA riding courses and segregated courses placed immediately below open graded friction courses by removing and replacing these segregated areas for the full depth of the riding course and extend at

least 300 feet on either side of the segregated areas.

- 7 Overlay the entire roadway with an open grade friction course when more than 25% of the final roadway surface area is corrected due to segregation. Place the open graded friction course at no additional expense to the Department.
- 8 Meet all compaction and rideability requirements on roads with corrected segregated areas.

401.4.29 Rideability

- 1 Ensure that pavement rideability meets the requirements of **SC-M-403**.

401.4.30 Plant Tickets

- 1 Record in triplicate on forms approved by the RCE the net weight of each load of HMA, the accumulated net weight of the loads for the day, and if loaded from a silo, the silo identification number.
- 2 When each load of HMA is delivered to the work, present the original copy of the plant ticket for the load to the RCE. Maintain the stub copy until the completion of the work. Deliver copies to the RCE at the end of the project.
- 3 Note any changes in the amounts designated on all copies of the tickets necessitated by the rejection of material and the reason stated for rejection.
- 4 At any time during the delivery of material and for the purpose of checking the weighing equipment at the plant, the RCE may request that any truckload of HMA delivered to the work be weighed on tested and approved platform scales at no additional expense to the Department.

401.5 Measurement

- 1 The quantity for HMA Intermediate Course and HMA Surface Course is the weight of the material placed determined by using approved scales with no deduction made for the weight of asphalt materials, hydrated lime, liquid anti-stripping agent, or any other admixtures and is measured by the ton (TON) of material, complete in place, and accepted,
- 2 The quantity for HMA base course is measured by the unit specified in the Contract. When measurement is specified by the ton (TON), measurement is in accordance with the requirements of this subsection. When measurement is specified by the square yard (SY), measurement is in accordance with the requirements of **Section 309** or **310** for Asphalt Base Course.
- 3 The quantity for Liquid Binder (of the performance grade specified) in the HMA is measured by the ton (TON) of liquid asphalt binder contained in the work and accepted. The amount of binder in the HMA is determined by **SC-T-63**, **SC-T-64**, or **SC-T-75** or, at the option of the RCE, from the amounts printed on the load tickets using an approved ticket printer. In order to check scale accuracy when using a ticket printer for measurement of binder, perform periodic extraction tests (not for pay purposes) on HMA other than those that contain marine limestone or slag.

- 4 Weight of binder that may be absorbed by the aggregate is not included in the quantity of binder.
- 5 When the binder content is not being measured by ticket printout, the quantity of binder in the HMA is the percentage of binder determined at the field laboratory unless otherwise directed by the RCE.
- 6 HMA wasted or lost due to negligence, HMA or binder applied in excess of the rate specified or directed in writing, or HMA applied beyond the limits of the work is deducted from pay quantity.
- 7 The quantity for Milling Existing Asphalt Pavement is surface area of asphalt pavement milled to the specified depth measured and is measured by the square yard (SY), complete in-place, and accepted. The measurement is made on the surface of the road or area designated for milling. No additional measurement is made for variable milling needed to tie in to existing drives and intersections unless specifically directed by the RCE.
- 8 The quantity for Surface Plane Asphalt Pavement is the surface area of the road planed to the specified texture and is measured by the square yard (SY), complete, and accepted. Surface planing conducted outside of the area designated for planing is disregarded in the quantity, except where necessary to provide acceptable cross-slope and lane/shoulder transition as directed by the RCE.
- 9 The quantity for Full Depth Asphalt Pavement Patching is surface area of full depth asphalt pavement patched to a uniform depth and is measured by the square yard (SY), complete, and accepted. Base course material used in the patching work is measured by the ton (TON) of Graded Aggregate Base in accordance with **Subsection 305.5**.
- 10 The quantity for Milled-In Rumble Strip is the sum of the length of the segments of rumble strips milled into the asphalt pavement as indicated on the Plans or as directed by the RCE and is measured by the mile (MI), complete, and accepted. The length of a segment is measured along the inside edge of the shoulder from the center of the first rumble strip in a segment to the center of the last rumble strip in that segment. Where MIRS are provided on more than one shoulder, the segments on each shoulder are measured separately and then, added together.

401.6 Payment

- 1 Adjustments in the contract unit bid prices for HMA courses are determined in accordance with **SC-M-400**. The unit bid prices of HMA courses may be adjusted due to fluctuations in the Monthly Asphalt Price Index or the Monthly Fuel Price Index only if specified as applicable in the Special Provisions.
- 2 Payment for the accepted quantity for HMA Intermediate Course or HMA Surface Course (of the type specified), measured in accordance with **Subsection 401.5**, is determined using the contract (or adjusted) unit price for the applicable pay item. For specific requirements and listing of pay items for the HMA Intermediate Courses and HMA Surface Courses, refer to

Sections 402 and 403, respectively.

- 3 Payment for the accepted quantity for Asphalt Base Course (of the type specified), measured in accordance with **Subsection 401.5**, is determined using the contract (or adjusted) unit price for the applicable pay item. For specific requirements and listing of pay items for the asphalt base courses, refer to **Sections 309 and 310**.
- 4 The above mentioned contract (or adjusted) unit prices and payments for all HMA courses are full compensation for constructing the HMA base course, intermediate course, or surface course as specified or directed and includes furnishing, mixing, hauling, placing, and compacting the HMA course; furnishing and applying a tack coat; determining the compaction of the course; and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.
- 5 Unless otherwise specified in the Contract, hydrated lime and any other admixtures are not paid for separately. Include all costs for furnishing and incorporating the hydrated lime and any other admixtures into the HMA in the contract (or adjusted) unit price of the HMA course.
- 6 Payment the accepted quantity for Liquid Asphalt Binder (of the performance grade specified), measured in accordance with **Subsection 401.5**, is determined using the contract (or adjusted) unit price for the applicable pay item. Payment is full compensation for providing the required liquid asphalt binder as specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.
- 7 Payment for the accepted quantity for full depth Full Depth Asphalt Pavement Patching (of the specified uniform depth), measured in accordance with **Subsection 401.5**, is determined using the contract (or adjusted) unit price for the applicable pay item. Payment is full compensation for patching deteriorated asphalt pavement as specified or directed and includes cleaning, removing, and disposing of debris from the patching work, and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.
- 8 Base course material used in the full depth asphalt pavement patching work is paid for as Graded Aggregate base in accordance with **Subsection 305.6**.
- 9 Payment for the accepted quantity for Milling Existing Asphalt Pavement (for the depth specified), measured in accordance with **Subsection 401.5**, is determined using the contract unit price for the applicable pay item. Payment is full compensation for milling the existing asphalt pavement as specified or directed and includes cleaning, removing, and disposing of debris from the milling work, and all other materials, labor, equipment, tools, supplies, trans-

portation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.

- 10 Payment for the accepted quantity for Surface Plane Asphalt Pavement, measured in accordance with **Subsection 401.5**, is determined using the contract unit bid price for the applicable pay item. Payment is full compensation for surfacing planing asphalt pavement as specified or directed and includes straightedge testing of planed surface; cleaning, removing, and disposing debris from planing work; and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.
- 11 Payment for the accepted quantity for Milled-In Rumble Strip measured in accordance with **Subsection 401.5**, is determined using the contract unit price for the applicable pay item. Payment is full compensation for milling the rumble strips into asphalt pavement as specified or directed and includes cleaning, removing, and disposing of debris from the work, and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract.
- 12 Payment for each item includes all direct and indirect costs and expenses necessary to complete the work.
- 13 Pay items under this section includes the following:

Item No.	Pay Item	Unit
4011004	Liquid Asphalt Binder PG64-22	TON
4011008	Liquid Asphalt Binder PG76-22	TON
4011010	Liquid Asphalt Binder PG82-22	TON
4012030	Full Depth Asphalt Pavement Patching 3" Uniform	SY
4012040	Full Depth Asphalt Pavement Patching 4" Uniform	SY
4012060	Full Depth Asphalt Pavement Patching 6" Uniform	SY
4012080	Full Depth Asphalt Pavement Patching 8" Uniform	SY
4012100	Full Depth Asphalt Pavement Patching 10" Uniform	SY
4012120	Full Depth Asphalt Pavement Patching 12" Uniform	SY
4013001	Surface Plane Asphalt Pavement	SY
4013XXX	Milling Existing Asphalt Pavement (X)"	SY
4013990	Milling Existing Asphalt Pavement (Variable)	SY
4019000	Milled-In Rumble Strip	MI

SECTION 402

HMA INTERMEDIATE COURSE

402.1 Description

- 1 This section contains specifications for the materials, equipment, construction, measurement, and payment for hot mixed asphalt (HMA) intermediate courses composed of mineral aggregate and binder, mixed in an approved asphalt plant, constructed on a prepared surface, and in conformance with the lines, grades, dimensions, thickness, and typical cross-section shown on the Plans or as otherwise specified.

402.2 Materials

402.2.1 General

- 1 Provide and use materials that meet the applicable requirements of **Subsection 401.2** and **SC-M-402**.

402.2.2 Composition of Mixture

- 1 Combine the mineral aggregates and binder in such proportions so that the composition by weight of the finished HMA is within the composition limits shown in **Subsection 401.2.3** and **SC-M-402**.

402.3 Equipment

- 1 Provide equipment meeting the requirements of **Subsection 401.3**.

402.4 Construction

- 1 Construction HMA intermediate courses in accordance with the requirements specified in **Subsection 401.4**.

402.5 Measurement

- 1 Measurement of the quantity for HMA Intermediate Course Type (A, B, or C) is performed in accordance with **Subsection 401.5**.

402.6 Payment

- 1 Payment for the accepted quantity for HMA Intermediate Course Type (A, B, or C) is determined in accordance with **Subsection 401.6**.
- 2 Payment for each item includes all direct and indirect costs and expenses required to complete the work.

402.6

402.6

3 Pay items under this section include the following:

Item No.	Pay Item	Unit
4020310	HMA Intermediate Course Type A	TON
4020320	HMA Intermediate Course Type B	TON
4020330	HMA Intermediate Course Type C	TON

SECTION 403

HMA SURFACE COURSE

403.1 Description

- 1 This section contains specifications for the materials, equipment, construction, measurement, and payment for HMA surface courses composed of mineral aggregate and binder, mixed in an approved plant, constructed on a prepared surface, and in conformance with the lines, grades, dimensions, thickness, and typical cross-section shown on the Plans or as otherwise specified.

403.2 Materials

403.2.1 General

- 1 Use materials that meet the applicable requirements of **Subsection 401.2** and **SC-M-402**.

403.2.2 Composition of Mixture

- 1 Combine the mineral aggregates and binder in such proportions that the composition by weight of the finished HMA is within the limits set forth in **SC-M-402**.
- 2 A job mix formula is not required for the HMA Surface Course Type E; however, maintain a binder content within an allowable variation $\pm 0.4\%$ of the content approved by the MRE.
- 3 If included in the Contract, use HMA Surface Course Type C or D for Ditch Paving.

403.3 Equipment

- 1 Provide equipment meeting the requirements of **Subsection 401.3**.

403.4 Construction

- 1 Construct HMA surface courses in accordance with the requirements specified in **Subsection 401.4**.

403.5 Measurement

- 1 Measurement of the quantity for HMA Intermediate Course Type (A, B, CM, C, D, or E) is determined in accordance with **Subsection 401.5** with the following addition:
- When the item of HMA Surface Course for Ditch Paving is included in the Contract, the binder in the ditch paving mixture is not measured for separate payment.

403.6 Payment

- 1 Payment for the accepted quantity for HMA Intermediate Course Type (A, B, CM, C, D, or E) is determined in accordance with **Subsection 401.6** with the following addition:

- When the item HMA Surface Course for Ditch Paving is included in the Contract, the cost of the binder material in the ditch paving mixture is considered included in the contract unit price for the work and is not paid for separately.
- 2 Payment for each item includes all direct and indirect costs and expenses required to complete the work.
- 3 Pay items under this section include the following:

Item No.	Pay Item	Unit
4030310	HMA Surface Course Type A	TON
4030320	HMA Surface Course Type B	TON
4030330	HMA Surface Course Type CM	TON
4030340	HMA Surface Course Type C	TON
4030350	HMA Surface Course Type D	TON
4030360	HMA Surface Course Type E	TON
4037000	HMA Surface Course for Ditch Paving	TON

SECTION 32 13 13.06

PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES

PART 1 GENERAL

1.1 SUBMITTALS

Concrete is to have 28-day compressive strength of 4,000 psi, with fiber mesh reinforcement allowable in the mix, no welded wire fabric. Place reinforcement according to concrete slab detail on the plans. All reinforcement shall be 100% tied.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Reinforcement;

Concrete Mix Design;

Slump Tests; Air Tests

SD-07 Certificates

Ready-mixed Concrete Plant; Batch Tickets

1.2 QUALITY ASSURANCE

1.2.1 Ready-mixed Concrete Plant Certification

Unless otherwise approved by the Contracting Officer, ready mixed concrete must be produced and provided by a National Ready-Mix Concrete Association (NRMCA) certified plant. If a volumetric mobile mixer is used to produce the concrete, rather than ready-mixed concrete, the mixer(s) must conform to the standards of the Volumetric Mixer Manufacturers Bureau (VMMB). Verification must be made by a current VMMB conformance plate affixed to the volumetric mixer equipment.

1.2.2 Contractor Qualifications

Unless waived by the Contracting Officer, the Contractor must meet one of the following criteria:

- a. Contractor must have at least one National Ready Mixed Concrete Association (NRMCA) certified concrete craftsman and at least one American Concrete Institute (ACI) Flatwork Finisher Certified craftsman on site, overseeing each placement crew during all concrete placement.
- b. Contractor must have no less than three NRMCA certified concrete installers and at least two American Concrete Institute (ACI) Flatwork Finisher Certified installers, who must be on site working as members of each placement crew during all concrete placement.

1.2.3 Required Information

Submit copies of laboratory test reports showing that the mix has been successfully tested to produce concrete with the properties specified and that mix will be suitable for the job conditions. The laboratory test reports must include mill test and all other test for cementitious materials, aggregates, and admixtures. Provide maximum nominal aggregate size, combined aggregate gradation analysis, percentage retained and passing sieve, and a graph of percentage retained versus sieve size.

Submit test reports along with the concrete mix design. Sampling and testing of materials, concrete mix design, sampling and testing in the field must be performed by a commercial testing laboratory which conforms to ASTM C1077. The laboratory must be approved in writing by the Contracting Officer.

1.2.4 Batch Tickets

ASTM C94. Submit mandatory batch ticket information for each load of ready-mixed concrete.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION

3.1 FORMS

3.1.1 Construction

Construct forms to be removable without damaging the concrete.

3.1.2 Coating

Before placing the concrete, coat the contact surfaces of forms except existing pavement sections where bonding is required, with a non-staining mineral oil, non-staining form coating compound, biodegradable form release agent, or two coats of nitro-cellulose lacquer.

3.1.3 Grade and Alignment

Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.2 REINFORCEMENT

3.2.1 Dowel Bars

Install bars accurately aligned, vertically and horizontally, at indicated locations and to the dimensions and tolerances indicated. Before installation thoroughly grease the sliding portion of each dowel. Dowels must remain in position during concrete placement and curing.

3.2.2 Coated Dowel Bars

Install bars, accurately aligned vertically and horizontally, at indicated locations and to the dimensions and tolerances indicated. Reject coatings which are perforated, cracked or otherwise damaged. While handling avoid scuffing or gouging of the coatings.

3.2.3 Tie Bars

Install bars, accurately aligned horizontally and vertically, at indicated locations.

3.2.4 Setting Slab Reinforcement

Reinforcement must be positioned on suitable chairs prior to concrete placement. At expansion, contraction and construction joints, place the reinforcement as indicated. Reinforcement, when placed in concrete, must be free of mud, oil, scale or other foreign materials. Place reinforcement accurately and wire securely. The laps at splices must be 12 inches minimum and the distances from ends and sides of slabs and joints must be as indicated.

3.2.5 Placing

Follow guidance of ACI 301, except as modified herein. Do not exceed a free vertical drop of 5 feet from the point of discharge. Deposit concrete either directly from the transporting equipment or by conveyor on to the pre-wetted subgrade or subbase, unless otherwise specified. Do not place concrete on frozen subgrade or subbase. Deposit the concrete between the forms to an approximately uniform height. Place concrete continuously at a uniform rate, with minimum amount of segregation, without damage to the grade and without unscheduled stops except for equipment failure or other emergencies. If this occurs within 10 feet of a previously placed expansion joint, remove concrete back to joint, repair any damage to grade, install a construction joint and continue placing concrete only after cause of the stop has been corrected.

3.2.6 Vibration

Immediately after spreading concrete, consolidate concrete with internal type vibrating equipment along the boundaries of all slabs regardless of slab thickness, and interior of all concrete slabs 6 inches or more in thickness. Limit duration of vibration to that necessary to produce consolidation of concrete. Excessive vibration will not be permitted. Vibrators must not be operated in concrete at one location for more than 15 seconds. Vibrating equipment of a type approved by the Contracting Officer may be used to consolidate concrete in unreinforced pavement slabs less than 6 inches thick.

3.2.6.1 Vibrating Equipment

Operate equipment, except hand-manipulated equipment, ahead of the finishing machine. Select the number of vibrating units and power of each unit to properly consolidate the concrete. Mount units on a frame that is capable of vertical movement and, when necessary, radial movement, so vibrators may be operated at any desired depth within the slab or be completely withdrawn from the concrete. Clear distance between frame-mounted vibrating units that have spuds that extend into the slab at intervals across the paving lane must not exceed 30 inches. Distance between end of vibrating tube and side form must not exceed 2 inches. For pavements less than 10 inches thick, operate vibrators at mid-depth parallel with or at a slight angle to the subbase. For thicker pavements, angle vibrators toward the vertical, with vibrator tip preferably about 2 inches from subbase, and top of vibrator a few inches below pavement surface. Vibrators may be pneumatic, gas driven, or electric, and must be operated at frequencies within the concrete of not less than 8,000 vibrations per minute. Amplitude of vibration must be such that noticeable vibrations occur at 1.5 foot radius when the vibrator is inserted in the concrete to the depth specified.

3.2.7 Cold Weather

Except with authorization, do not place concrete when ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. When authorized, when concrete is likely to be subjected to freezing within 24 hours after placing, heat concrete materials so that temperature of concrete when deposited is between 65 and 80 degrees F. Methods of heating materials are subject to approval of the Contracting Officer. Do not heat mixing water above 165 degrees F. Remove lumps of frozen material and ice from aggregates before placing aggregates in mixer. Follow practices found in ACI 306.1.

3.2.8 Hot Weather

Maintain required concrete temperature in accordance with Figure NRMCA NOMOGRAPH FOR ESTIMATING EVAPORATION RATE ON THE BASIS OF MENZEL FORMULA in ACI 305.1 to prevent evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. After placement, use fog spray, apply monomolecular film, or use other suitable means to reduce the evaporation rate. Start curing when surface of fresh concrete is sufficiently hard to permit curing without damage. Cool underlying material by sprinkling lightly with water before placing concrete. Follow practices found in ACI 305.1.

3.3 PAVING

Pavement must be constructed with paving and finishing equipment utilizing fixed forms.

3.3.1 Consolidation

The paver vibrators must be inserted into the concrete not closer to the underlying material than 2 inches. The vibrators or tamping units in front of the paver must be automatically controlled so that they stop immediately as forward motion ceases. Excessive vibration must not be permitted. Concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment must be vibrated with a hand-operated immersion vibrator. Vibrators must not be used to transport or spread the concrete.

3.3.2 Operation

When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions must be made to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of debris, and placing rubber mats beneath the paver tracks. Transversely oscillating screeds and extrusion plates must overlap the existing pavement the minimum possible, but in no case more than 8 inches.

3.3.3 Required Results

The paver-finisher must be operated to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The paver-finishing operation must produce a surface finish free of irregularities, tears, voids of any kind, and other discontinuities. It must produce only a minimum of paste at the surface. Multiple passes of the paver-finisher must not be permitted. The equipment and its operation must produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. No water, other than true fog sprays (mist), must be applied to the concrete surface during paving and finishing.

3.3.4 Fixed Form Paving

Forms must be steel, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. The base width of the form must be not less than eight-tenths of the vertical height of the form, except that forms 8 inches or less in vertical height must have a base width not less than the vertical height of the form. Wood forms for curves and fillets must be adequate in strength and rigidly braced. Forms must be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Forms must not be set on blocks or on built-up spots of underlying material.

Forms for overlay pavements and for other locations where forms must be set on existing pavements must be held securely in place with stakes or by other approved methods. Holes in existing pavements for form stakes must be carefully drilled without cracking or spalling the existing pavement. Prior to setting forms for paving operations, demonstrate the proposed form setting procedures at an approved location and do not proceed further until the proposed method is approved. Forms must remain in place at least 12 hours after the concrete has been placed. Forms must be removed without injuring the concrete.

3.3.5 Placing Reinforcing Steel

Reinforcement must be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement.

Dowels must be installed with alignment not greater than 1/8 inch per ft. Except as otherwise specified below, location of dowels must be within a horizontal tolerance of plus or minus 5/8 inch and a vertical tolerance of plus or minus 3/16 inch. The portion of each dowel intended to move within the concrete or expansion cap must be painted with one coat of rust inhibiting primer paint, and then oiled just prior to placement. Dowels and tie bars in joints must be omitted when the center of the dowel tie bar is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness.

3.3.6.1 Contraction Joints

Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane must be held securely in place by means of rigid metal basket assemblies. The dowels and tie bars must be welded to the assembly or held firmly by mechanical locking arrangements that will prevent them from becoming distorted during paving operations. The basket assemblies must be held securely in the proper location by means of suitable anchors.

3.3.6.2 Construction Joints-Fixed Form Paving

Installation of dowels and tie bars must be by the bonded-in-place method, supported by means of devices fastened to the forms. Installation by removing and replacing in preformed holes will not be permitted.

3.3.6.3 Dowels Installed in Hardened Concrete

Installation must be by bonding the dowels into holes drilled into the hardened concrete. Holes approximately 1/8 inch greater in diameter than the dowels must be drilled into the hardened concrete. Dowels must be bonded in the drilled holes using epoxy resin injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel is not permitted. The dowels must be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic collar fitted around the dowel. The vertical alignment of the dowels must be checked by placing the straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel.

3.3.6.4 Expansion Joints

Dowels in expansion joints must be installed by the bonded-in-place method or by bonding into holes drilled in hardened concrete, using procedures specified above.

3.4 FINISHING CONCRETE

Start finishing operations immediately after placement of concrete. Use finishing machine, except hand finishing may be used in emergencies and for concrete slabs in inaccessible locations or of such shapes or sizes that machine finishing is impracticable. Finish pavement surface on both sides of a joint to the same grade. Finish formed joints from a securely supported transverse bridge. Provide hand finishing equipment for use at all times. Transverse and longitudinal surface tolerances must not exceed 1/4 inch in 10 feet.

3.4.1 Side Form Finishing

Strike off and screed concrete to the required slope and cross-section by a power-driven transverse finishing machine. Transverse rotating tube or pipe is not permitted unless approved by the Contracting Officer. Elevation of concrete must be such that, when consolidated and finished, pavement surface will be adequately consolidated and at the required grade. Equip finishing machine with two screeds which are readily and accurately adjustable for changes in pavement slope and compensation for wear and other causes. Make as many passes over each area of pavement and at such intervals as necessary to give proper compaction, retention of coarse aggregate near the finished surface, and a surface of uniform texture, true to grade and slope. Do not permit excessive operation over an area, which will result in an excess of mortar and water being brought to the surface.

3.4.1.1 Equipment Operation

Maintain the travel of machine on the forms without lifting, wobbling, or other variation of the machine which tend to affect the precision of concrete finish. Keep the tops of the forms clean by a device attached to the machine. During the first pass of the finishing machine, maintain a uniform ridge of concrete ahead of the front screed for its entire length.

3.4.1.2 Joint Finish

Before concrete is hardened, correct edge slump of pavement, exclusive of edge rounding, in excess of 0.02 foot. Finish concrete surface on each side of construction joints to the same plane, and correct deviations before newly placed concrete has hardened.

3.4.1.3 Hand Finishing

Strike-off and screed surface of concrete to elevations slightly above finish grade so that when concrete is consolidated and finished pavement surface is at the indicated elevation. Vibrate entire surface until required compaction and reduction of surface voids is secured with a strike-off template.

3.4.1.4 Longitudinal Floating

After initial finishing, further smooth and consolidate concrete by means of hand-operated longitudinal floats. Use floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.

3.4.2 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement must be given a texture as described herein. Following initial texturing on the first day of placement, the Placing Foreman, Contracting Officer representative, and a representative of the Using Agency must inspect the texturing for compliance with design requirements. After curing is complete, all textured surfaces must be thoroughly power broomed to remove all debris. The concrete in areas of recesses for tie-down anchors, lighting fixtures, and other outlets in the pavement must be finished to provide a surface of the same texture as the surrounding area.

3.4.2.1 Brooming

Finish the surface of the slab by brooming the surface with a new wire broom at least 18 inches wide. Gently pull the broom over the surface of the pavement from edge to edge just before the concrete becomes non-plastic. Slightly overlap adjacent strokes of the broom. Broom perpendicular to centerline of pavement so that corrugations produced will be uniform in character and width, and not more than 1/16 inch in depth. Broomed surface must be free from porous spots, irregularities, depressions, and small pockets or rough spots such as may be caused by accidentally disturbing particles of coarse aggregate embedded near the surface.

3.4.3 Edging

At the time the concrete has attained a degree of hardness suitable for edging, carefully finish slab edges, including edges at formed joints, with an edge having a maximum radius of 1/8 inch. When brooming is specified for the final surface finish, edge transverse joints before starting brooming, then operate broom to obliterate as much as possible the mark left by the edging tool without disturbing the rounded corner left by the edger. Clean by removing loose fragments and soupy mortar from corners or edges of slabs which have crumbled and areas which lack sufficient mortar for proper finishing. Refill voids solidly with a mixture of suitable proportions and consistency and refinish. Remove unnecessary tool marks and edges. Remaining edges must be smooth and true to line.

3.4.4 Repair of Surface Defects

Follow guidance of ACI 301.

3.5 CURING AND PROTECTION

Protect concrete adequately from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks and oil stains, and do not allow it to dry out from the time it is placed until the expiration of the minimum curing periods specified herein. Use White-Burlap-Polyethylene Sheet or liquid membrane-forming compound, except as specified otherwise herein. Do not use membrane-forming compound on surfaces where its appearance would be objectionable, on surfaces to be painted, where coverings are to be bonded to concrete, or on concrete to which other concrete is to be bonded. Maintain temperature of air next to concrete above 40 degrees F for the full curing periods.

3.5.1 White-Burlap-Polyethylene Sheet

Wet entire exposed surface thoroughly with a fine spray of water, saturate burlap but do not have excessive water dripping off the burlap and then cover concrete with White-Burlap-Polyethylene Sheet, burlap side down. Lay sheets directly on concrete surface and overlap 12 inches. Make sheeting not less than 18 inches wider than concrete surface to be cured, and weight down on the edges and over the transverse laps to form closed joints. Repair or replace sheets when damaged during curing. Check daily to assure burlap has not lost all moisture. If moisture evaporates, resaturate burlap and re-place on pavement (re-saturation and re-placing must take no longer than 10 minutes per sheet). Leave sheeting on concrete surface to be cured for at least 7 days.

3.5.2 Liquid Membrane-Forming Compound Curing

Apply compound immediately after surface loses its water sheen and has a dull appearance and before joints are sawed. Agitate curing compound thoroughly by mechanical means during use and apply uniformly in a two-coat continuous operation by suitable power-spraying equipment. Total coverage for the two coats must be at least one gallon of undiluted compound per 200 square feet. Compound must form a uniform, continuous, coherent film that will not check, crack, or peel and must be free from pinholes or other imperfections. Apply an additional coat of compound immediately to areas where film is defective. Respray concrete surfaces that are subject to heavy rainfall within 3 hours after curing compound has been applied in the same manner.

3.5.2.1 Protection of Treated Surfaces

Keep concrete surfaces to which liquid membrane-forming compounds have been applied free from vehicular traffic and other sources of abrasion for not less than 72 hours. Foot traffic is allowed after 24 hours for inspection purposes. Maintain continuity of coating for entire curing period and repair damage to coating immediately.

3.5.3 Liquid Chemical Sealer-Hardener

Apply sealer-hardener to interior floors not receiving floor covering and floors located under access flooring. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. The sealer-hardener must not be applied until the concrete has been moist cured and has aged for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.

3.6 FIELD QUALITY CONTROL

The Contractor's approved laboratory must collect samples of fresh concrete in accordance with ASTM C172 during each working day as required to perform tests specified herein. Make test specimens in accordance with ASTM C31.

3.6.1 Consistency Tests

The Contractor's approved laboratory must perform concrete slump tests in accordance with ASTM C143. Take samples for slump determination from concrete during placement. Perform tests at the beginning of a concrete placement operation and for each batch (minimum) or every 20 cubic yards (maximum) of concrete to ensure that specification requirements are met. In addition, perform tests each time test beams and cylinders are made.

3.6.2 Flexural Strength Tests

The Contractor's approved laboratory must test for flexural strength in accordance with ASTM C78. Make four test specimens for each set of tests. Test two specimens at 7 and 14 days, and the other two at 28 days. Concrete strength will be considered satisfactory when the minimum of the 28-day test results equals or exceeds the specified 28-day flexural strength, and no individual strength test is less than 550 pounds per square inch. If the ratio of the 28-day strength test to the specified 28-day strength is less than 65 percent, make necessary adjustments for conformance. Frequency of flexural tests on concrete beams must be not less than four test beams for each 50 cubic yards of concrete, or fraction thereof, placed. Concrete which is determined to be defective, based on the strength acceptance criteria therein, must be removed and replaced with acceptable concrete.

3.6.3 Air Content Tests

Test air-entrained concrete for air content at the same frequency as specified for slump tests. Determine percentage of air in accordance with ASTM C231 on samples taken during placement of concrete in forms.

3.6.4 Surface Testing

Surface testing for surface smoothness and plan grade must be performed as indicated below by the Testing Laboratory. The measurements must be properly referenced in accordance with paving lane identification and stationing, and a report given to the Contracting Officer within 24 hours after measurement is made. A final report of surface testing, signed by a Registered Engineer, containing all surface measurements and a description of all actions taken to correct deficiencies, must be provided to the Contracting Officer upon conclusion of surface testing.

3.6.4.1 Surface Smoothness Requirements

Surface smoothness must be measured every 150 square feet. The finished surfaces of the pavements must have no abrupt change of 1/8 inch or more, and all pavements must be within the tolerances specified when checked with a 12 foot straightedge: 1/5 inch longitudinal and 1/4 inch transverse directions for roads and streets and 1/4 inch for both directions for other concrete surfaces, such as parking areas.

3.6.4.2 Surface Smoothness Testing Method

The surface of the pavement must be tested with the straightedge to identify all surface irregularities exceeding the tolerances specified above. The straightedge must be 12 feet and be constructed of aluminum or other lightweight metal and must have blades of box or box-girder cross section with flat bottom reinforced to ensure rigidity and accuracy. Straightedges must have handles to facilitate movement on pavement. The entire area of the pavement must be tested in both a longitudinal and a transverse direction on parallel lines approximately 15 feet apart. The straightedge must be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity must be determined by placing the straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.

-- End of Section

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SECTION 32 16 19
CONCRETE CURBS, GUTTERS & SIDEWALKS

PART 1 GENERAL

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

PCC Mix Design
Field Quality Control

1.3 EQUIPMENT, TOOLS, AND MACHINES

1.3.1 General Requirements

Plant, equipment, machines, and tools used in the work will be subject to approval and must be maintained in a satisfactory working condition at all times. Use equipment capable of producing the required product, meeting grade controls, thickness control and smoothness requirements as specified. Discontinue using equipment that produces unsatisfactory results. Allow the Contracting Officer access at all times to the plant and equipment to ensure proper operation and compliance with specifications.

1.3.2 Slip Form Equipment

Slip form paver or curb forming machines, will be approved based on trial use on the job and must be self-propelled, automatically controlled, crawler mounted, and capable of spreading, consolidating, and shaping the plastic concrete to the desired cross section in one pass.

1.4 ENVIRONMENTAL REQUIREMENTS

1.4.1 Placing During Cold Weather

Do not place concrete when the air temperature reaches 40 degrees F and is falling, or is already below that point. Placement may begin when the air temperature reaches 35 degrees F and is rising, or is already above 40 degrees F. Make provisions to protect the concrete from freezing during the specified curing period. If necessary to place concrete when the temperature of the air, aggregates, or water is below 35 degrees F, placement and protection must be approved in writing. Approval will be contingent upon full conformance with the following provisions. Prepare and protect the underlying material so that it is entirely free of frost when the concrete is deposited. Heat mixing water and aggregates as necessary to result in the temperature of the in-place concrete being between 50 and 85 degrees F. Methods and equipment for heating must be approved. Use only aggregates that are free of ice, snow, and frozen lumps before entering the mixer. Provide covering or other means as needed to maintain the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period.

1.4.2 Placing During Warm Weather

The temperature of the concrete as placed must not exceed 85 degrees F except where an approved retarder is used. Cool the mixing water and aggregates as necessary to maintain a satisfactory placing temperature. The placing temperature must not exceed 95 degrees F at any time.

PART 2 PRODUCTS

2.1 CONCRETE

Provide concrete conforming to the applicable requirements of ASTM C94 except as otherwise specified. Concrete must have a minimum compressive strength of 4,000 psi at 28 days. Size of aggregate must not exceed 1-1/2 inches. Submit copies of certified delivery tickets for all concrete used in the construction.

2.1.1 Air Content

Use concrete mixtures that have an air content by volume of concrete of 5 to 7 percent (plus or minus 1.5%), based on measurements made immediately after discharge from the mixer.

2.1.2 Slump

Use concrete with a slump of 3 inches plus or minus 1 inch for hand placed concrete or 1 inch plus or minus 1/2 inch for slipformed concrete as determined in accordance with ASTM C143.

2.1.3 Reinforcement Steel

Use reinforcement bars conforming to ASTM A615.

2.2 CONCRETE CURING MATERIALS

2.2.1 Impervious Sheet Materials

Use impervious sheet materials conforming to ASTM C171, type optional, except that polyethylene film, if used, must be white opaque.

2.2.2 Burlap

Use burlap conforming to AASHTO M 182.

2.2.3 White Pigmented Membrane-Forming Curing Compound

Use white pigmented membrane-forming curing compound conforming to ASTM C309, Type 2.

2.3 CONCRETE PROTECTION MATERIALS

Use concrete protection materials consisting of a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.4 JOINT FILLER STRIPS

2.4.1 Contraction Joint Filler for Curb and Gutter

Use hard-pressed fiberboard contraction joint filler for curb and gutter.

2.4.2 Expansion Joint Filler, Pre-molded

Unless otherwise indicated, use 1/2 inch thick pre-molded expansion joint filler conforming to ASTM D1751 or ASTM D1752.

2.5 JOINT SEALANTS

Use cold-applied joint sealant conforming to ASTM C920 or ASTM D5893.

2.6 FORM WORK

Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Use wood or steel forms that are straight and of sufficient strength to resist springing during depositing and consolidating concrete.

2.6.1 Wood Forms

Use forms that are surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Use forms with a nominal length of 10 feet. Radius bends may be formed with 3/4 inch boards, laminated to the required thickness.

2.6.2 Steel Forms

Use channel-formed sections with a flat top surface and welded braces at each end and at not less than two intermediate points. Use forms with interlocking and self-aligning ends. Provide flexible forms for radius forming, corner forms, form spreaders, and fillers as needed. Use forms with a nominal length of 10 feet and that have a minimum of 3 welded stake pockets per form. Use stake pins consisting of solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

2.6.3 Sidewalk Forms

Use sidewalk forms that are of a height equal to the full depth of the finished sidewalk.

2.6.4 Curb and Gutter Forms

Use curb and gutter outside forms that have a height equal to the full depth of the curb or gutter. Use rigid forms for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

2.7 Detectable Warning System

Detectable Warning Systems shown on the Contract plans are to meet requirements of ICC A117.1 COMM - Section 705.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

Construct subgrade to the specified grade and cross section prior to concrete placement.

3.1.1 Sidewalk Subgrade

Place and compact the subgrade in accordance with Section 31 23 00.00 20 EXCAVATION AND FILL. Test the subgrade for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.1.2 Curb and Gutter Subgrade

Place and compact the subgrade in accordance with Section 32 11 23 AGGREGATE BASE COURSES. Test the subgrade for grade and cross section by means of a template extending the full width of the curb and gutter. Use subgrade materials equal in bearing quality to the subgrade under the adjacent pavement.

3.1.3 Maintenance of Subgrade

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Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade must be in a moist condition when concrete is placed. Prepare and protect subgrade so that it is free from frost when the concrete is deposited.

3.2 FORM SETTING

Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms. Remove forms in a manner that will not injure the concrete. Do not use bars or heavy tools against the concrete when removing the forms. Promptly and satisfactorily repair concrete found to be defective after form removal. Clean forms and coat with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

3.2.1 Sidewalks

Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment must be checked with a 10 foot straightedge. Sidewalks must have a transverse slope as indicated of 1/4 inch per foot Unless otherwise indicated, construct sidewalks that are located adjacent to curbs with the low side adjacent to the curb. Do not remove side forms less than 12 hours after finishing has been completed.

3.2.2 Curbs and Gutters

Remove forms used along the front of the curb not less than 2 hours nor more than 6 hours after the concrete has been placed. Do not remove forms used along the back of curb until the face and top of the curb have been finished, as specified for concrete finishing. Do not remove gutter forms while the concrete is sufficiently plastic to slump in any direction.

3.3 SIDEWALK CONCRETE PLACEMENT AND FINISHING

3.3.1 Formed Sidewalks

Place concrete in the forms in one layer. When consolidated and finished, the sidewalks must be of the thickness indicated. Use a strike-off guided by side forms after concrete has been placed in the forms to bring the surface to proper section to be compacted. Consolidate concrete by tamping and spading or with an approved vibrator. Finish the surface to grade with a strike off.

3.3.2 Concrete Finishing

After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

3.3.3 Edge and Joint Finishing

Finish all slab edges, including those at formed joints, with an edger having a radius of 1/8 inch. Edge transverse joints before brooming. Eliminate the flat surface left by the surface face of the edger with brooming. Clean and solidly fill corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing with a properly proportioned mortar mixture and then finish.

3.3.4 Surface and Thickness Tolerances

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

3.4 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

3.4.1 Formed Curb and Gutter

Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Curve shaped gutters must be finished with a standard curb "mule".

3.4.2 Curb and Gutter Finishing

Approved slipformed curb and gutter machines may be used in lieu of hand placement.

3.4.3 Concrete Finishing

Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter and entrance to grade with a wood float.

3.4.4 Joint Finishing

Finish curb edges at formed joints as indicated.

3.4.5 Surface and Thickness Tolerances

Finished surfaces must not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.5 SIDEWALK JOINTS

Construct sidewalk joints to divide the surface into rectangular areas. Space transverse contraction joints at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and continuous across the slab. Construct longitudinal contraction joints along the centerline of all sidewalks 10 feet or more in width. Construct transverse expansion joints at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, install transverse expansion joints as indicated. Form expansion joints around structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

3.5.1 Sidewalk Contraction Joints

Form contraction joints in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness. Unless otherwise approved or indicated, either use a jointer to cut the groove or saw a groove in the hardened concrete with a power-driven saw. Construct sawed joints by sawing a groove in the concrete with a 1/8 inch blade. Provide an ample supply of saw blades on the jobsite before concrete placement is started. Provide at least one standby sawing unit in good working order at the jobsite at all times during the sawing operations.

3.5.2 Sidewalk Expansion Joints

Form expansion joints using 1/2 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1752 or building paper. Hold joint filler in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, round joint edges using an edging tool having a radius of 1/8 inch. Remove any concrete over the joint filler. At the end of the curing

Horry Records Center, 2205 Church Street (Hwy. 501), Conway, SC 29526

period, clean the top of expansion joints and fill with cold-applied joint sealant. Use joint sealant that is gray or stone in color. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Apply joint sealing material only when the concrete at the joint is surface dry and atmospheric and concrete temperatures are above 50 degrees F. Immediately remove any excess material on exposed surfaces of the concrete and clean the concrete surfaces.

3.6 CURB AND GUTTER JOINTS

Construct curb and gutter joints at right angles to the line of curb and gutter.

3.6.1 Contraction Joints

Construct contraction joints directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length.

- a. Construct contraction joints (except for slip forming) by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Remove separators as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.
- b. When slip forming is used, cut the contraction joints in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. Cut the contraction joint to a depth of at least one-fourth of the gutter/curb depth using a 1/8 inch saw blade.

3.6.2 Expansion Joints

Form expansion joints by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Construct expansion joints in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement using the same type and thickness of joints as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, provide expansion joints at least 1/2 inch in width at intervals not less than 30 feet nor greater than 120 feet. Seal expansion joints immediately following curing of the concrete or as soon thereafter as weather conditions permit. Seal expansion joints and the top 1 inch depth of curb and gutter contraction-joints with joint sealant. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Concrete at the joint must be surface dry and atmospheric and concrete temperatures must be above 50 degrees F at the time of application of joint sealing material. Immediately remove excess material on exposed surfaces of the concrete and clean concrete surfaces.

3.7 CURING AND PROTECTION

3.7.1 General Requirements

Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete must be on hand and ready for use before actual concrete placement begins. Protect concrete as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

3.7.1.1 Mat Method

Cover the entire exposed surface with two or more layers of burlap. Overlap mats at least 6 inches. Thoroughly wet the mat with water prior to placing on concrete surface and keep the mat continuously in a saturated condition and in intimate contact with concrete for not less than 7 days.

3.7.1.2 Impervious Sheeting Method

Wet the entire exposed surface with a fine spray of water and then cover with impervious sheeting material. Lay sheets directly on the concrete surface with the light-colored side up and overlapped 12 inches when a continuous sheet is not used. Use sheeting that is not less than 18-inches wider than the concrete surface to be cured. Secure sheeting using heavy wood planks or a bank of moist earth placed along edges and laps in the sheets. Satisfactorily repair or replace sheets that are torn or otherwise damaged during curing. Sheeting must remain on the concrete surface to be cured for not less than 7 days.

3.7.1.3 Membrane Curing Method

Apply a uniform coating of white-pigmented membrane-curing compound to the entire exposed surface of the concrete as soon after finishing as the free water has disappeared from the finished surface. Coat formed surfaces immediately after the forms are removed and in no case longer than 1 hour after the removal of forms. Do not allow concrete surface to dry before application of the membrane. If drying has occurred, moisten the surface of the concrete with a fine spray of water and apply the curing compound as soon as the free water disappears. Apply curing compound in two coats by hand-operated pressure sprayers at a coverage of approximately 200 square feet/gallon for the total of both coats. Apply the second coat in a direction approximately at right angles to the direction of application of the first coat. The compound must form a uniform, continuous, coherent film that will not check, crack, or peel and must be free from pinholes or other imperfections. If pinholes, abrasion, or other discontinuities exist, apply an additional coat to the affected areas within 30 minutes. Respray concrete surfaces that are subjected to heavy rainfall within 3 hours after the curing compound has been applied by the method and at the coverage specified above. Respray areas where the curing compound is damaged by subsequent construction operations within the curing period. Take precautions necessary to ensure that the concrete is properly cured at sawed joints, and that no curing compound enters the joints. Tightly seal the top of the joint opening and the joint groove at exposed edges before the concrete in the region of the joint is resprayed with curing compound. Use a method used for sealing the joint groove that prevents loss of moisture from the joint during the entire specified curing period. Provide approved standby facilities for curing concrete pavement at a location accessible to the jobsite for use in the event of mechanical failure of the spraying equipment or other conditions that might prevent correct application of the membrane-curing compound at the proper time. Adequately protect concrete surfaces to which membrane-curing compounds have been applied during the entire curing period from pedestrian and vehicular traffic, except as required for joint-sawing operations and surface tests, and from other possible damage to the continuity of the membrane.

3.7.2 Backfilling

After curing, remove debris and backfill, grade, and compact the area adjoining the concrete to conform to the surrounding area in accordance with lines and grades indicated.

3.7.3 Protection

Protect completed concrete from damage until accepted. Repair damaged concrete and clean concrete discolored during construction. Remove and reconstruct concrete that is damaged for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Dispose of removed material as directed.

3.7.4 Protective Coating

Apply a protective coating of linseed oil mixture to the exposed-to-view concrete surface after the curing period, if concrete will be exposed to de-icing chemicals within 6 weeks after placement. Moist cure concrete to receive a protective coating.

3.7.4.1 Application

Complete curing and backfilling operation prior to applying two coats of protective coating. Concrete must be surface dry and clean before each application. Spray apply at a rate of not more than 50 square yards/gallon for first application and not more than 70 square yards/gallon for second application, except that the number

Horry Records Center, 2205 Church Street (Hwy. 501), Conway, SC 29526

of applications and coverage for each application for commercially prepared mixture must be in accordance with the manufacturer's instructions. Protect coated surfaces from vehicular and pedestrian traffic until dry.

3.7.4.2 Precautions

Do not heat protective coating by direct application of flame or electrical heaters and protect the coating from exposure to open flame, sparks, and fire adjacent to open containers or applicators. Do not apply material at ambient or material temperatures lower than 50 degrees F.

3.8 FIELD QUALITY CONTROL

Submit copies of all test reports within 24 hours of completion of the test.

3.8.1 General Requirements

Perform the inspection and tests described and meet the specified requirements for inspection details and frequency of testing. Based upon the results of these inspections and tests, take the action and submit reports as required below, and additional tests to ensure that the requirements of these specifications are met.

3.8.2 Concrete Testing

3.8.2.1 Strength Testing

Take concrete samples in accordance with ASTM C172 not less than once a day nor less than once for every 250 cubic yards of concrete placed. Mold cylinders in accordance with ASTM C31 for strength testing by an approved laboratory. Each strength test result must be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

3.8.2.2 Air Content

Determine air content in accordance with ASTM C173 or ASTM C231. Use ASTM C231 with concretes and mortars made with relatively dense natural aggregates. Make two tests for air content on randomly selected batches of each class of concrete placed during each shift. Make additional tests when excessive variation in concrete workability is reported by the placing foreman or the Owner inspector. Notify the placing foreman if results are out of tolerance. The placing foreman must take appropriate action to have the air content corrected at the plant. Additional tests for air content will be performed on each truckload of material until such time as the air content is within the tolerance specified.

3.8.2.3 Slump Test

Perform two slump tests on randomly selected batches of each class of concrete for every 250 cubic yards, or fraction thereof, of concrete placed during each shift. Perform additional tests when excessive variation in the workability of the concrete is noted or when excessive crumbling or slumping is noted along the edges of slip-formed concrete.

3.8.3 Thickness Evaluation

Determine the anticipated thickness of the concrete prior to placement by passing a template through the formed section or by measuring the depth of opening of the extrusion template of the curb forming machine. If a slip form paver is used for sidewalk placement, construct the subgrade true to grade prior to concrete placement. The thickness will be determined by measuring each edge of the completed slab.

3.8.4 Surface Evaluation

Provide finished surfaces for each category of the completed work that are uniform in color and free of blemishes and form or tool marks.

3.9 SURFACE DEFICIENCIES AND CORRECTIONS

3.9.1 Thickness Deficiency

When measurements indicate that the completed concrete section is deficient in thickness by more than 1/4 inch the deficient section will be removed, between regularly scheduled joints, and replaced.

3.9.2 High Areas

In areas not meeting surface smoothness and plan grade requirements, reduce high areas either by rubbing the freshly finished concrete with carborundum brick and water when the concrete is less than 36 hours old or by grinding the hardened concrete with an approved surface grinding machine after the concrete is 36 hours old or more. The area corrected by grinding the surface of the hardened concrete must not exceed 5 percent of the area of any integral slab, and the depth of grinding must not exceed 1/4 inch. Remove and replace pavement areas requiring grade or surface smoothness corrections in excess of the limits specified.

3.9.3 Appearance

Exposed surfaces of the finished work will be inspected by the Contracting Officer and deficiencies in appearance will be identified. Remove and replace areas which exhibit excessive cracking, discoloration, form marks, or tool marks or which are otherwise inconsistent with the overall appearances of the work.

3.10 DETECTABLE WARNING SYSTEM

Install Detectable Warning Systems required by Contract plans in accordance with ICC A117.1 COMM, Section 705, and by manufacturers' installation instructions.

-- End of Section --

Section 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Surface Preparation Equipment List;

Application Equipment List;

Exterior Surface Preparation

Thermoplastic compound; G

1.2 QUALITY ASSURANCE

1.2.1 Regulatory Requirements

Submit certificate stating that the proposed pavement marking paint meets the Volatile Organic Compound, (VOC) regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located. Submit Safety Data Sheets for each product.

1.2.2 Qualifications

Submit documentation certifying that pertinent personnel are qualified for equipment operation and handling of applicable chemicals. The documentation should include experience on five projects of similar size and scope with references for all personnel.

1.3 DELIVERY AND STORAGE

Deliver paint materials, thermoplastic compound materials, and reflective media in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer.

Provide storage facilities at the job site, only in areas approved by the Contracting Officer, for maintaining materials at temperatures recommended by the manufacturer. Make available paint stored at the project site or segregated at the source for sampling not less than 30 days prior to date of required approval for use to allow sufficient time for testing. Notify the Contracting Officer when paint is available for sampling.

1.4 PROJECT/SITE CONDITIONS

1.4.1 Environmental Requirements

1.4.1.1 Weather Limitations for Application

Apply pavement markings to clean, dry surfaces, and unless otherwise approved, only when the air and pavement surface temperature is at least 5 degrees F above the dew point and the air and pavement temperatures are within the limits recommended by the pavement marking manufacturer. Allow pavement

surfaces to dry after water has been used for cleaning or rainfall has occurred prior to striping or marking. Test the pavement surface for moisture before beginning work each day and after cleaning. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer. Employ the "plastic wrap method" to test the pavement for moisture as specified in paragraph TESTING FOR MOISTURE.

1.4.2 Traffic Controls

Place warning signs conforming to MUTCD near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Place small markers along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

When traffic must be rerouted or controlled to accomplish the work, provide necessary warning signs, flag persons, and related equipment for the safe passage of vehicles.

1.4.3 Lighting

When night operations are necessary, provide all necessary lighting and equipment. The Owner reserves the right to accept or reject night work on the day following night activities by the Contractor.

PART 2 PRODUCTS

2.1 EQUIPMENT

2.1.1 Surface Preparation and Paint Removal

2.1.1.1 Surface Preparation Equipment for Roads and Automotive Parking Areas

Submit a surface preparation equipment list by serial number, type, model, and manufacturer. Include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation. Mobile equipment must allow for removal of markings without damaging the pavement surface or joint sealant. Maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition.

2.1.1.1.1 Grinding or Scarifying Equipment

Use equipment capable of removing surface contaminants, paint build-up, or extraneous markings from the pavement surface without leaving any residue. Clean the surface by hydro blast to remove surface contaminants and ash after a weed torch is used to remove paint.

2.1.2 Application Equipment

Submit application equipment list appropriate for the material(s) to be used. Include manufacturer's descriptive data and certification for the planned use that indicates area of coverage per pass, pressure adjustment range, tank and flow capacities, and all safety precautions required for operating and maintaining the equipment. Provide and maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition, or remove them from the work site. Provide mobile and maneuverable application equipment to the extent that straight lines can be followed and normal curves can be made in a true arc.

2.1.2.1 Paint Application Equipment

2.1.2.1.1 Hand-Operated, Push-Type Machines

Provide hand-operated push-type applicator machine of a type commonly used for application of water based paint or two-component, chemically curing paint, thermoplastic, or preformed tape, to pavement surfaces for small marking projects, such as legends and cross-walks, automotive parking areas, or surface painted signs. Provide applicator machine equipped with the necessary tanks and spraying nozzles capable of applying paint uniformly at coverage specified. Hand operated spray guns may be used in areas where push-type machines cannot be used.

2.1.2.1.2 Hand Application

Provide spray guns for hand application of paint in areas where the mobile paint applicator cannot be used.

2.1.2.2 Thermoplastic Application Equipment

2.1.2.2.1 Thermoplastic Material

Apply thermoplastic material with equipment that is capable of providing continuous uniformity in the dimensions and reflectorization of the marking.

2.1.2.2.2 Application Equipment

- a. Provide application equipment capable of continuous mixing and agitation of the material, with conveying parts which prevent accumulation and clogging between the main material reservoir and the extrusion shoe or spray gun. All parts of the equipment which come into contact with the material must be easily accessible and exposed for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns must maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.
- b. Provide application equipment constructed to ensure continuous uniformity in the dimensions of the stripe. Provide an applicator with a means for cleanly cutting off stripe ends squarely and providing a method of applying "skiplines." Provide equipment capable of applying varying widths of traffic markings.
- c. Provide mobile and maneuverable application equipment allowing straight lines to be followed and normal curves to be made in a true arc. Provide equipment used for the placement of thermoplastic pavement markings of two general types: mobile applicator and portable applicator.
- d. Equip the applicator with a pressurized or drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow. The bead dispenser must operate automatically to begin flow prior to the flow of binder to assure that the strip is fully reflectorized.

2.1.2.2.3 Mobile Application Equipment

Provide a truck-mounted, self-contained pavement marking machine that is capable of hot applying thermoplastic by either the extrusion or spray method.

- a. Equip the unit to apply the thermoplastic marking material at temperatures according to the manufacturer's instructions, at widths varying from 3 to 12 inches, with an automatic pressurized or drop-on bead dispensing system, capable of operating continuously, and of installing a minimum of 20,000 lineal feet of longitudinal markings in an 8-hour day.
- b. Equip the mobile unit with a melting kettle which holds a minimum of 6000 pounds of molten

thermoplastic material; capable of heating the thermoplastic composition to temperatures as recommended by the manufacturer. Use a thermostatically controlled heat transfer liquid. Heating of the composition by direct flame is not allowed. Oil and material temperature gauges must be visible at both ends of the kettle.

- c. Equip mobile units for application of extruded markings with a minimum of two extrusion shoes; located one on each side of the truck, capable of marking simultaneous edge line and centerline stripes; each being a closed, oil-jacketed unit; holding the molten thermoplastic at a temperature as recommended by the manufacturer; and capable of extruding a line of 3 to 8 inches in width; and at a thickness of not less than 0.120 inch nor more than 0.190 inch, of generally uniform cross section.
- d. Equip mobile units for application of spray markings with a spray gun system capable of marking simultaneous edgeline and centerline stripes. Surround (jacket) the spray system with heating oil to maintain the molten thermoplastic at a temperature of 375 to 425 degrees F, capable of spraying a stripe of 3 to 12 inches in width, and in thicknesses varying from 0.060 inch to 0.098 inch, of generally uniform cross section.
- e. Equip the mobile unit with an electronic programmable line pattern control system, capable of applying skip or solid lines in any sequence, through any and all of the extrusion shoes, or the spray guns, and in programmable cycle lengths. In addition, equip the mobile unit with an automatic counting mechanism capable of recording the number of lineal feet of thermoplastic markings applied to the pavement surface with an accuracy of 0.5 percent.

2.1.2.2.4 Portable Application Equipment

Provide portable hand-operated equipment, specifically designed for placing special markings such as crosswalks, stop bars, legends, arrows, and short lengths of lane, edge and centerlines; and capable of applying thermoplastic pavement markings by the extrusion method. Equip the portable applicator with all the necessary components, including a materials storage reservoir, bead dispenser, extrusion shoe, and heating accessories, capable of holding the molten thermoplastic at the temperature recommended by the manufacturer, and of extruding a line of 3 to 12 inches in width, and in thickness of not less than 0.120 inch nor more than 0.190 inch and of generally uniform cross section.

2.1.2.3 Reflective Media Dispenser

Attach the dispenser for applying the reflective media to the thermoplastic dispenser and designed to operate automatically and simultaneously with the applicator through the same control mechanism. The bead applicator must be capable of adjustment and designed to provide uniform flow of reflective media over the full length and width of the stripe at the rate of coverage specified in paragraph APPLICATION.

2.2 MATERIALS

Use thermoplastic for roads. Use thermoplastic for automotive parking areas. The maximum allowable VOC content of pavement markings is 150 grams per liter. Color of markings are indicated on the drawings and must conform to ASTM D6628 for roads and automotive parking areas and SAE AMS-STD-595A for airfields. Provide materials conforming to the requirements specified herein.

2.2.1 Thermoplastic Compound

2.2.1.1 Composition Requirements

Thermoplastic compound must conform to AASHTO M 249. Formulate the binder component as an alkyd resin.

2.2.2 Reflective Media for Roads AASHTO

M247, Type 1.

3.1 EXAMINATION

3.1.1 Testing for Moisture

Test the pavement surface for moisture before beginning pavement marking after each period of rainfall, fog, high humidity, or cleaning, or when the ambient temperature has fallen below the dew point. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer or authorized representative.

Employ the "plastic wrap method" to test the pavement for moisture as follows: Cover the pavement with a 12 inch by 12 inch section of clear plastic wrap and seal the edges with tape. After 15 minutes, examine the plastic wrap for any visible moisture accumulation inside the plastic. Do not begin marking operations until the test can be performed with no visible moisture accumulation inside the plastic wrap. Re-test surfaces when work has been stopped due to rain.

3.1.2 Surface Preparation Demonstration

Prior to surface preparation, demonstrate the proposed procedures and equipment. Prepare areas large enough to determine cleanliness and rate of cleaning. Perform a demonstration removal of pavement marking in an area designated by the Contracting Officer.

3.1.3 Test Stripe Demonstration

Prior to paint application, demonstrate test stripe application within the work area using the proposed materials and equipment. Apply separate test stripes in each of the line widths and configurations required herein using the proposed equipment. Make the test stripes long enough to determine the proper speed and operating pressures for the vehicle(s) and machinery, but not less than 50 feet long.

3.1.4 Application Rate Demonstration

During the Test Stripe Demonstration, demonstrate compliance with the application rates specified herein. Document the equipment speed and operating pressures required to meet the specified rates in each configuration of the equipment and provide a copy of the documentation to the Contracting Officer prior to proceeding with the work.

3.1.5 Level of Performance Demonstration

The Contracting Officer will be present at the application demonstrations to observe the results obtained and to validate the operating parameters of the vehicle(s) and equipment. If accepted by the Contracting Officer, the test stripe is the measure of performance required for this project. Do not proceed with the work until the demonstration results are satisfactory to the Contracting Officer.

3.2 EXTERIOR SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required.

3.2.1 Early Painting of Asphalt Pavements

For asphalt pavement systems requiring painting application at less than 30 days, apply the paint and beads at half the normal application rate, followed by a second application at the normal rate after 30 days.

3.3 APPLICATION

Apply pavement markings to dry pavements only.

3.3.1 Thermoplastic Compound

Place thermoplastic pavement markings, free from dirt or tint, upon dry pavement. The temperature must be a minimum of 40 degrees F and rising at the time of installation. Apply all centerline, skipline, edgeline, and other longitudinal type markings with a mobile applicator. Place all special markings, crosswalks, stop bars, legends, arrows, and similar patterns with a portable applicator, using the extrusion method.

3.3.1.1 Primer

After surface preparation has been completed, prime the asphalt or concrete pavement surface with spray equipment. Allow primer materials to "set-up" prior to applying the thermoplastic composition. Allow the asphalt concrete primer to dry to a tack-free condition, usually occurring in less than 10 minutes. Apply asphalt concrete primer to all asphalt concrete pavements at a wet film thickness of 0.005 inch, plus or minus 0.001 inch (265 to 400 square feet per gallon).

After the primer has "set-up", apply the thermoplastic at temperatures no lower than 375 degrees F nor higher than 425 degrees F at the point of deposition. Apply all extruded thermoplastic markings at the specified width and at a thickness of not less than 0.125 inch nor more than 0.190 inch. Apply all sprayed thermoplastic markings at the specified width and the thickness designated in the contract plans. If the plans do not specify a thickness, apply centerline markings at a wet thickness of 0.090 inch, plus or minus 0.005 inch, and edgeline markings at a wet thickness of 0.060 inch, plus or minus 0.005 inch.

3.3.1.2 Reflective Media

Immediately after installation of the thermoplastic material, mechanically apply drop-on reflective glass spheres conforming to AASHTO M 247 Type 1 at the rate of one pound per 20 square feet such that the spheres are held by and imbedded in the surface of the molten material. Accomplish drop-on application of the glass spheres to ensure even distribution at the specified rate of coverage. If there is a malfunction of either thermoplastic applicator or reflective media dispenser, discontinue operations until deficiency is corrected.

3.3.2 Cleanup and Waste Disposal

Keep the worksite clean and free of debris and waste from the removal and application operations. Dispose of debris at approved sites.

3.4 FIELD QUALITY CONTROL

3.4.1 Sampling and Testing

As soon as the paint and thermoplastic materials and reflective media are available for sampling, obtain by random selection from the sealed containers, four quart samples of each batch in the presence of the Contracting Officer. Two quarts will be for sampling and testing by the Contractor and two quarts will be for retention by the Owner. Accomplish adequate mixing prior to sampling to ensure a uniform, representative sample. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Clearly identify samples by designated name, specification number, batch number, project contract number, intended use, and quantity involved.

Test samples by an approved laboratory. If a sample fails to meet specification, replace the material in the area represented by the samples and retest the replacement material as specified above. Submit certified copies of the test reports, prior to the use of the materials at the jobsite. Include in the report of test results a listing of any specification requirements not verified by the test laboratory.

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. Provide test results substantiating conformance to the specified requirements with each certificate of compliance.

3.4.3 Dimensional Tolerances

Apply all markings in the standard dimensions provide in the drawings. New markings may deviate a maximum of 10 percent larger than the standard dimension. The maximum deviation allowed when painting over an old marking is up to 20 percent larger than the standard dimensions.

3.4.4 Bond Failure Verification

Inspect newly applied markings for signs of bond failure based on visual inspection and comparison to results from Test Stripe Demonstration paragraph.

3.4.5 Reflective Media and Coating Application Verification

Use a wet film thickness gauge to measure the application of wet paint. Use a microscope or magnifying glass to evaluate the embedment of glass beads in the paint. Verify the glass bead embedment with approximately 50 percent of the individual bead spheres embedded and 50 percent of the individual bead spheres exposed.

-- End of Section --

SECTION 33 40 00
STORM DRAIN UTILITIES

1.1 GENERAL – Not Used

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-04 Samples

Pipe for Culverts and Storm Drains

Junction Boxes , Drop Inlets, and Curb Inlets

Certificates for:

Resin Certification

Oil Resistant Gasket

Hydrostatic Test on Watertight Joints

Determination of Density

Frame and Cover for Gratings and Outlet Structures

As-Built Certification of Stormwater Control Measures (SCMs)

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Before, during, and after installation, plastic pipe and fittings shall be protected from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer. Solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.

1.3.2 Handling

Materials shall be handled in a manner that ensures delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.

Manufactured in accordance with and conforming to ASTM C76, Class III, or ASTM C655.

2.1.2 Poly Vinyl Chloride (PVC) Pipe

Submit the pipe manufacturer's resin certification, indicating the cell classification of PVC used to manufacture the pipe, prior to installation of the pipe.

2.1.4.1 Type PSM PVC Pipe

ASTM D3034, Type PSM, maximum SDR 35, produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.1.4.2 Profile PVC Pipe

ASTM F794, Series 46, produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.1.4.3 Smooth Wall PVC Pipe

ASTM F679 produced from PVC certified by the Manufacturer as meeting the requirements of ASTM D1784, minimum cell class 12454-B.

2.1 MISCELLANEOUS MATERIALS

2.2.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 4,000 psi concrete under Section 03 30 00 CAST-IN-PLACE CONCRETE. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Air content shall be determined in accordance with ASTM C231. The concrete covering over steel reinforcing shall not be less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 3 inches between steel and ground. Expansion-joint filler material shall conform to ASTM D1751, or ASTM D1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D1752.

2.2.2 Mortar

Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except that the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.

2.2.3 Precast Concrete Segmental Blocks

Precast concrete segmental block shall conform to ASTM C139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.2.4 Brick

Brick shall conform to ASTM C62, Grade SW; ASTM C55, Grade S-I or S-II; or ASTM C32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be

Horry Records Center, 2205 Church Street (Hwy. 501), Conway, SC 29526

added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.

2.2.5 Precast Reinforced Concrete Manholes and Outlet Structures

Conform to ASTM C478. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.

2.2.6 Frame and Cover for Gratings and Outlet Structures

Submit certification on the ability of frame and cover or gratings to carry the imposed live load. Frame and cover for gratings shall be cast gray iron, ASTM A48, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26, Alloy 356.O-T6. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans. The word "Storm Sewer" shall be stamped or cast into covers so that it is plainly visible.

2.2.7 Joints

2.2.7.1 Flexible Watertight Joints

- a. Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for preformed flexible joint sealants shall conform to ASTM C990, and rubber-type gaskets shall conform to ASTM C443. Factory-fabricated resilient joint materials shall conform to ASTM C425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 54 inches.
- b. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished, if specifically approved.

2.2.7.2 External Sealing Bands

Requirements for external sealing bands shall conform to ASTM C877.

2.2.7.3 Flexible Watertight, Gasketed Joints

- a. Gaskets: When infiltration or exfiltration is a concern for pipe lines, the couplings may be required to have gaskets. The closed-cell expanded rubber gaskets shall be a continuous band approximately 7 inches wide and approximately 3/8 inch thick, meeting the requirements of ASTM D1056, Type 2 A1, and shall have a quality retention rating of not less than 70 percent when tested for weather resistance by ozone chamber exposure, Method B of ASTM D1171. Rubber O-ring gaskets shall be 13/16 inch in diameter for pipe diameters of 36 inches or smaller and 7/8 inch in diameter for larger pipe having 1/2 inch deep end corrugation. Rubber O-ring gaskets shall be 1-3/8 inches in diameter for pipe having 1 inch deep end corrugations. O-rings shall meet the requirements of ASTM C990 or ASTM C443. Preformed flexible joint sealants shall conform to ASTM C990, Type B.
- b. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards or specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.

2.2.7.4 PVC Plastic Pipes

Joints shall be solvent cement or elastomeric gasket type in accordance with the specification for the pipe and as recommended by the pipe manufacturer.

2.2 STEEL LADDER

Steel ladder shall be provided where the depth of the storm drainage structure exceeds 12 feet. These ladders shall be not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. The two stringers shall be a minimum 3/8 inch thick and 2-1/2 inches wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A123.

2.3 RESILIENT CONNECTORS

Flexible, watertight connectors used for connecting pipe to manholes and inlets shall conform to ASTM C923.

2.4 CURB CUTS

2.6.1 Concrete Curb and Gutter

Refer to Section 32 16 19 CONCRETE CURBS, GUTTERS AND SIDEWALKS.

2.6.2 Geotextile Separation Fabric Refer to Section

31 05 19 GEOTEXTILE.

2.6.3 Riprap

Use field stone or rough unhewn quarry stone for plain rip rap. Use stone that is sound, tough, dense, resistant to the action of air and water and suitable in all other respects for the purpose intended.

There shall be equal distribution of the various sizes of the stone within the required size range. The size of an individual stone particle will be determined by measuring its long dimension. Stone for curb cut riprap shall the following size distribution:

REQUIRED RIPRAP STONE SIZE, INCHES (NCDOT CLASS A)		
MINIMUM	MIDRANGE	MAXIMUM
2	4	6

No more than 5.0% of the material furnished can be less than the minimum size specified nor no more than 10.0% of the material can exceed the maximum size specified.

2.6.4 Non-woven Geotextile Separation Refer to

Section 31 05 19 GEOTEXTILE.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES

Horry Records Center, 2205 Church Street (Hwy. 501), Conway, SC 29526

Excavation of trenches, and for appurtenances and backfilling for culverts and storm drains, shall be in accordance with the applicable portions of

31 23 00.00 20 EXCAVATION AND FILL and the requirements specified below.

3.1.1 Trenching

The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 36 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing, where required, shall be placed within the trench width as specified, without any overexcavation. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures will be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Owner.

3.1.2 Removal of Rock

Rock in either ledge or boulder formation shall be replaced with suitable materials to provide a compacted earth cushion having a thickness between unremoved rock and the pipe of at least 8 inches or 1/2 inch for each foot of fill over the top of the pipe, whichever is greater, but not more than three-fourths the nominal diameter of the pipe. Where bell-and-spigot pipe is used, the cushion shall be maintained under the bell as well as under the straight portion of the pipe. Rock excavation shall be as specified and defined in Section 31 23 00.00 20 EXCAVATION AND FILL .

3.1.3 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the Owner.

3.2 BEDDING

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe.

3.2.1 Concrete Pipe Requirements

When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded in granular material minimum 4 inch in depth in trenches with soil foundation. Depth of granular bedding in trenches with rock foundation shall be 1/2 inch in depth per foot of depth of fill, minimum depth of bedding shall be 8 inch up to maximum depth of 24 inches. The middle third of the granular bedding shall be loosely placed. Bell holes and depressions for joints shall be removed and formed so entire barrel of pipe is uniformly supported. The bell hole and depressions for the joints shall be not more than the length, depth, and width required for properly making the particular type of joint.

3.3 PLACING PIPE

Each pipe shall be thoroughly examined before being laid; defective or damaged pipe shall not be used. Plastic pipe, excluding SRPE pipe shall be protected from exposure to direct sunlight prior to laying, if necessary to maintain adequate pipe stiffness and meet installation deflection requirements. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated pipe shall be placed in the same vertical plane as the major axis of the pipe. Pipe shall not be laid in water, and pipe shall not be laid when trench conditions or

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weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

3.3.1 Concrete, PVC Pipe

Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.

3.4 DRAINAGE STRUCTURES

3.4.1 Manholes, Inlets, and Pond Outlet Structures

Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete, precast concrete segmental blocks, prefabricated corrugated metal, or bituminous coated corrugated metal; complete with frames and covers or gratings; and with fixed galvanized steel ladders where indicated. Pipe studs and junction chambers of prefabricated corrugated metal manholes shall be fully bituminous-coated and paved when the connecting branch lines are so treated. Pipe connections to concrete manholes and inlets shall be made with flexible, watertight connectors.

3.4.2 Walls and Headwalls Construction shall be as indicated.

3.5 STEEL LADDER INSTALLATION

Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 6 feet vertically, and shall be installed to provide at least 6 inches of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

3.6 BACKFILLING

3.6.1 Backfilling Pipe in Trenches

After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 6 inches in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. The fill shall be thoroughly compacted under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation equal to the midpoint (spring line) of concrete pipe or has reached an elevation of at least 12 inches above the top of the pipe for flexible pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 6 inches. Tests for density shall be made as necessary to ensure conformance to the compaction requirements specified below. Where it is necessary, in the opinion of the Contracting Officer, that sheeting or portions of bracing used be left in place, the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.

3.6.2 Backfilling Pipe in Fill Sections

For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified below. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 6 inches in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 6 inches. Use select granular material for this entire region of backfill for flexible pipe installations.

3.6.3 Movement of Construction Machinery

When compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced. Construction machinery shall not enter the sand filter bed area during installation or at any time after.

3.6.4 Compaction

3.6.4.1 General Requirements

Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.

3.6.4.2 Minimum Density

Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density, which will be determined as specified below.

- a. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.
- b. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
- c. Under nontraffic areas, density shall be not less than that of the surrounding material.

3.7 FIELD PAINTING

3.7.1 Cast-Iron Covers, Frames, Gratings, And Steps

After installation, clean cast-iron, not buried in masonry or concrete, of mortar, rust, grease, dirt, and other deleterious materials to bare metal and apply a coat of bituminous paint.

3.8 FIELD QUALITY CONTROL

3.8.1 Tests

Testing is the responsibility of the Contractor. Perform all testing and retesting at no additional cost to the Owner.

3.8.1.1 HYDROSTATIC TEST ON WATERTIGHT JOINTS

Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Rubber gaskets shall comply with the oil resistant gasket requirements of ASTM C443. Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed.

3.12.1.1.1 Concrete, Pipe

A hydrostatic test shall be made on the watertight joint types as proposed. Only one sample joint of each

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type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to ASTM C990 or ASTM C443. Test requirements for joints in clay pipe shall conform to ASTM C425. Test requirements for joints in PVC pipe shall conform to ASTM D3212.

3.8.1.2 Determination of Density

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D2167 or ASTM D6938. When ASTM D6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D6938 results in a wet unit weight of soil and ASTM D6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D6938. Test results shall be furnished the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

3.8.1.3 Deflection Testing

Conduct deflection test no sooner than 30 days after completion of final backfill and compaction testing. Clean or flush all lines prior to testing. Perform a deflection test on entire length of installed flexible pipeline upon completion of work adjacent to and over the pipeline, including backfilling, placement of fill, grading, paving, placement of concrete, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads shall not exceed limits in paragraph PLACING PIPE above as percent of the average inside diameter of pipe. Use a mandrel to determine if allowable deflection has been exceeded.

3.12.1.3.1 Mandrel

Pass the mandrel through each run of pipe by pulling it by hand. If deflection readings in excess of the allowable deflection of average inside diameter of pipe are obtained, stop and begin test from the opposite direction. The mandrel must meet the Pipe Manufacturer's recommendations and the following requirements. Provide a Mandrel that is rigid, nonadjustable, has a minimum of 9 fins, pulling rings at each end, and is engraved with the nominal pipe size and mandrel outside diameter. The mandrel must be 5 percent less than the certified-actual pipe diameter for Plastic Pipe, 5 percent less than the certified-actual pipe diameter for Corrugated Steel and Aluminum, 3 percent less than the certified-actual pipe diameter for Concrete-Lined Corrugated Steel and Ductile Iron Culvert. The Owner will verify the outside diameter(OD)of the Contractor provided mandrel through the use of Contractor provided proving rings.

3.8.2 Inspection

3.8.2.1 Post-Installation Inspection

Visually inspect each segment of concrete pipe for alignment, settlement, joint separations, soil migration through the joint, cracks, buckling, bulging and deflection. An engineer must evaluate all defects to determine if any remediation or repair is required.

3.12.2.1.1 Concrete

Cracks with a width greater than 0.01 inches. An engineer must evaluate all pipes with cracks with a width greater than 0.01 inches but less than 0.10 inches to determine if any remediation or repair is required.

3.12.2.1.2 Flexible Pipe

Check each flexible pipe (PE, PVC, PP, Corrugated Steel And Aluminum) for rips, tears, joint separations, soil migration through the joint, cracks, localized bucking, bulges, settlement and alignment.

3.12.2.1.3 Post-Installation Inspection Report

The deflection results and final post installation inspection report must include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design, grade, deviation from line, deflection and deformation of flexible pipe, inspector notes, condition of joints, condition of pipe wall (e.g. distress, cracking, wall damage dents, bulges, creases, tears, holes, etc.).

3.8.3 Repair Of Defects

3.8.3.1 Leakage Test

When leakage exceeds the maximum amount specified, correct source of excess leakage by replacing damaged pipe and gaskets and retest.

3.8.3.2 Deflection Testing

When deflection readings are in excess of the allowable deflection of average inside diameter of pipe are obtained, remove pipe which has excessive deflection and replace with new pipe. Retest 30 days after completing backfill, leakage testing and compaction testing.

3.8.3.3 Inspection

Replace pipe or repair defects indicated in the Post-Installation Inspection Report.

3.12.3.3.1 Concrete

Replace pipes having cracks with a width greater than 0.1 inches.

3.12.3.3.2 Flexible Pipe

Replace pipes having cracks or splits.

3.8.4 As-Built Certification of Stormwater Control Measures (SCMs)

Contractor must provide As-Built Certification of all permanent Stormwater Control Measures (SCMs).

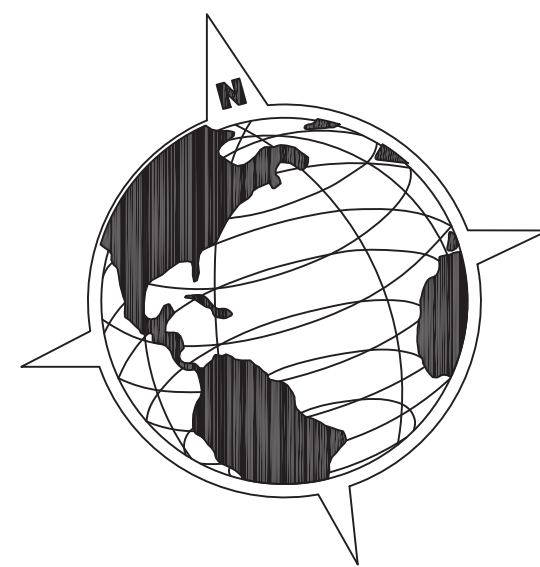
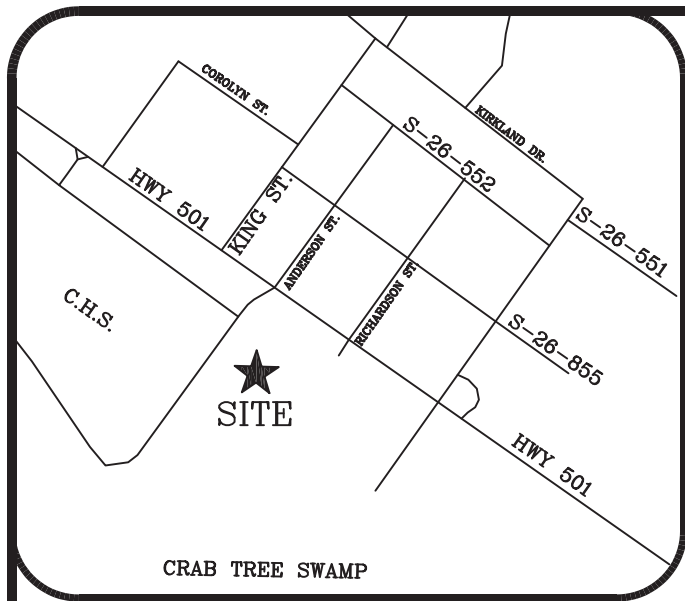
3.9 PROTECTION

Protect storm drainage piping and adjacent areas from superimposed and external loads during construction.

3.10 WARRANTY PERIOD

Pipe segments found to have defects during the warranty period must be replaced with new pipe and retested.

-- End of Section --



ECLS GLOBAL INC.

ADDRESS: 2205 HIGHWAY 501, CONWAY, SC 29527
COUNTY: HORRY
TMS: 122-00-05-100
PIN: 338-09-02-0012
ZONING: HC
MUNICIPALITY: CONWAY
TOTAL PROJECT AREA: 7.6 ACRES
TOTAL DISTURBED AREA: 3.3 ACRES
PROPOSED USE: FUELING STATION
ROADS AND DRAINAGE: HORRY COUNTY
OWNER & DEVELOPER: HORRY COUNTY BOARD OF EDUCATION 335 FOUR MILE ROAD CONWAY, SC 29528 843-448-0910
ENGINEER & SURVEYOR: ECLS GLOBAL INC 350 HILTON ROAD, SUITE 103 MYRTLE BEACH, SC 29572 843-945-2064

SITE CONSTRUCTION PLANS FOR: PROPANE BUS FUELING STATION & CDL TRAINING PAD AT HORRY RECORDS CENTER INCLUDES ROADWAY, GRADING, AND STORMWATER

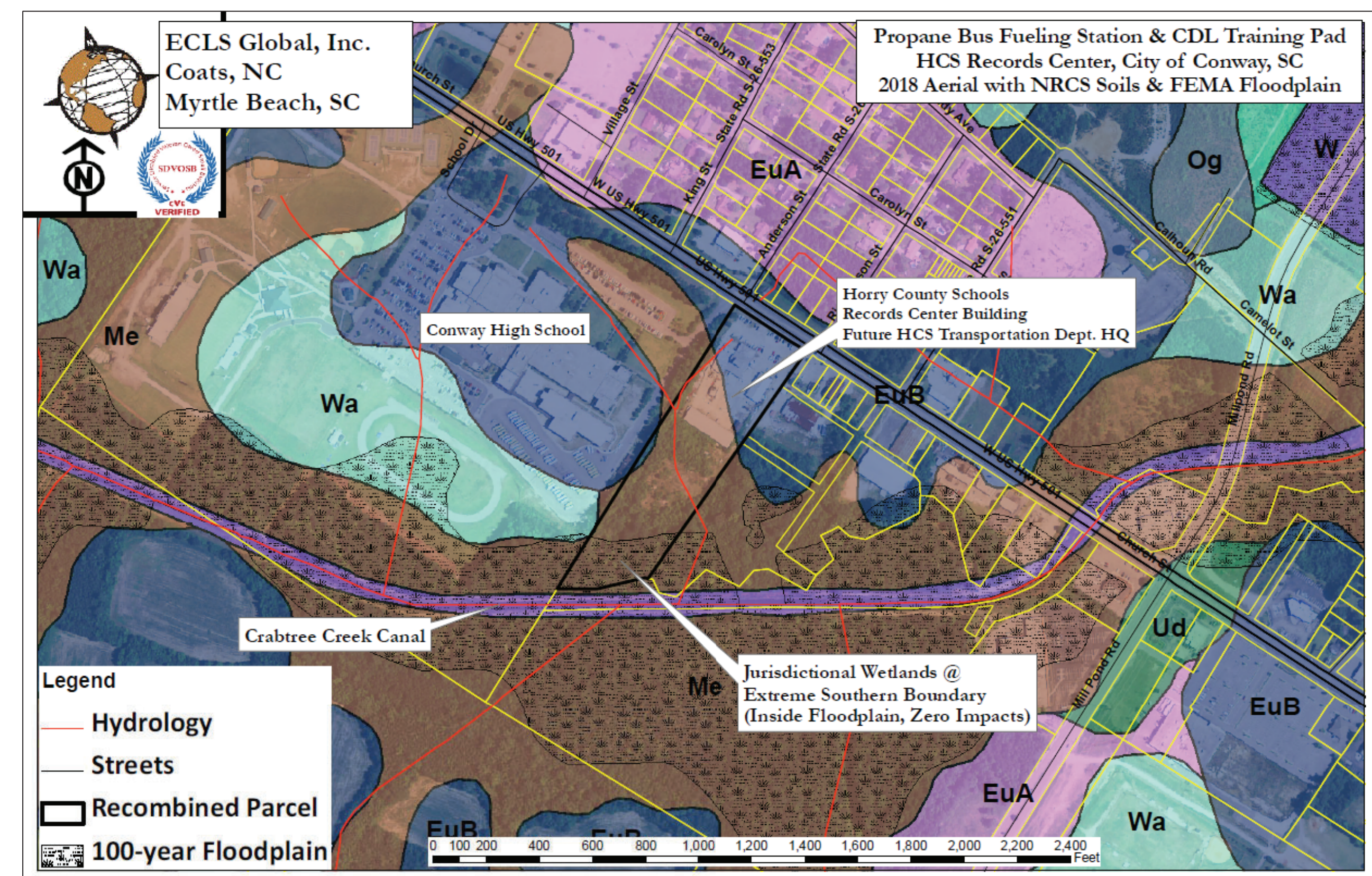
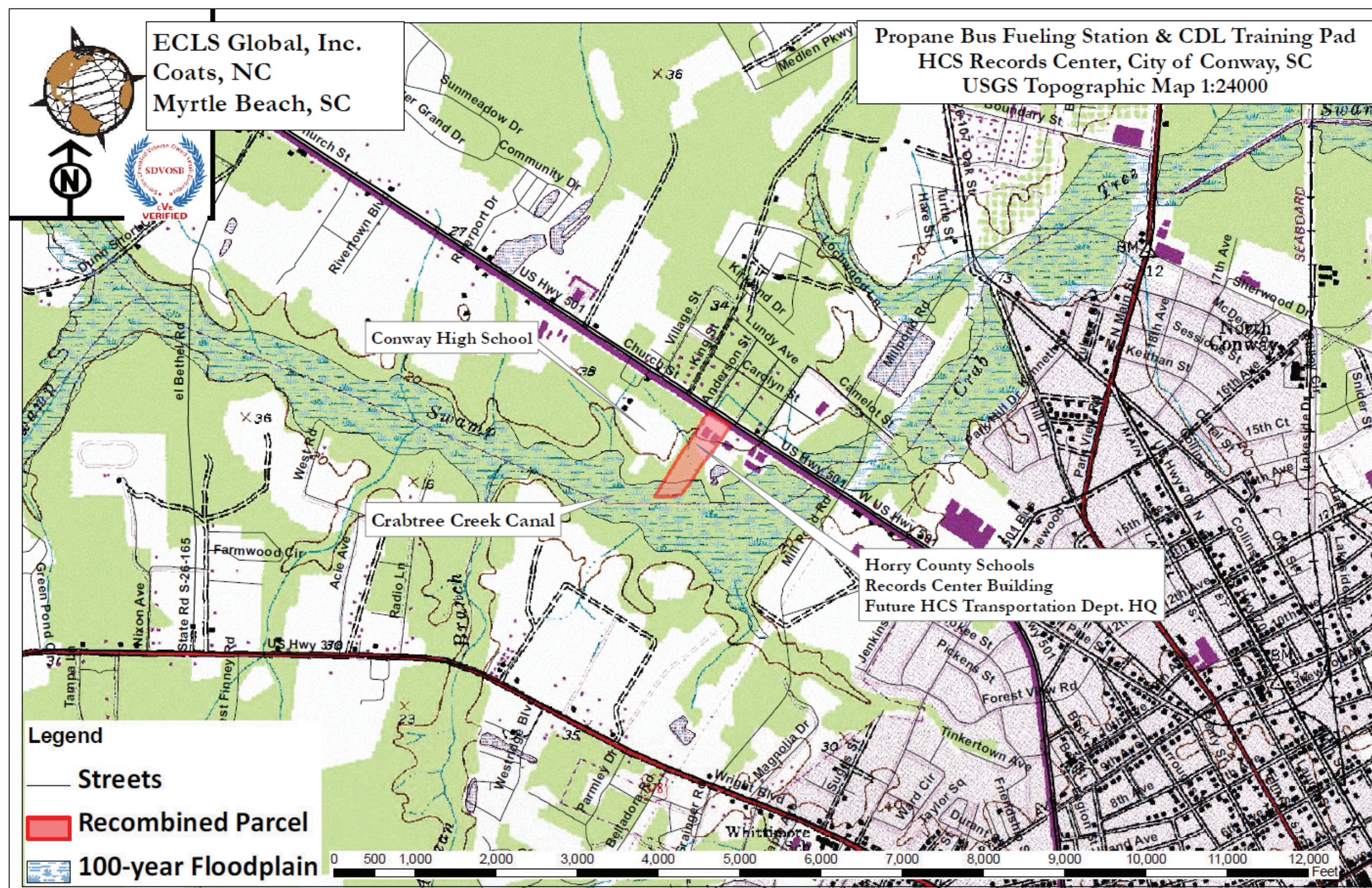
GRADING LEGEND	
X 100	EXISTING SPOT ELEVATION
X 100	FINISH GRADE SPOT ELEVATION
---	EXISTING CONTOUR
---	FINISH GRADE CONTOUR
---	DRAINAGE FLOW
G=	GROUND
FL=	FLOW LINE
HP=	HIGH POINT
○	-FREE
⊗	-TREE TO BE REMOVED
○	-TREE CANOPY

PLOT PLAN LEGEND	
---	BUILDING SETBACK
---	ROOF OVERHANG
A/C	AIR CONDITIONING UNIT
AL	AREA LIGHT
BOC	BACK OF CURB
CB	CATCH BASIN
CL	CENTERLINE ROAD
CO	CLEANOUT
CP	COMPUTED POINT
EB	ELECTRIC BOX
EIP	EXISTING IRON PIPE
EIR	EXISTING IRON ROD
EM	ELECTRIC METER
EP	EDGE OF PAVEMENT
ESU	ELECTRIC STUB UP
ET	ELECTRIC TRANSFORMER
HH	HANDHOLE
SCO	SEWER CLEANOUT
SSU	SEWER STUB UP
SW	SIDEWALK
TOC	TOP OF CONCRETE
TOD	TOP OF DITCH
TOE	TOE OF DITCH
TP	TELECOMMUNICATION
PEDESTAL	PEDESTAL
WM	WATER METER
WV	WATER VALVE

HORRY COUNTY ZONING	
R 75	SETBACKS PER HORRY COUNTY & 501 OVERLAY
FRONT	20'
REAR	10'
SIDE	5'
OVERLAY (FROM ROW)	500'

FLOOD NOTE	
THIS PROPERTY IS LOCATED IN FLOOD ZONE X	

HORIZONTAL DATUM: NAD 83
VERTICAL DATUM: NAVD 88
BENCHMARK: SEE SHEET C3



- SPECIFICATIONS LIST**
- 1) ANY WATER AND SEWER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CURRENT STANDARDS AND SPECIFICATIONS BY GWSA AND SCDHEC
 - 2) ROAD AND DRAINAGE CONSTRUCTION SHALL BE IN ACCORDANCE WITH HORRY COUNTY, THE CITY OF CONWAY AND SCDOT
 - 3) ALL WORK SHALL BE DONE IN ACCORDANCE WITH "SCHOOL FACILITIES PLANNING AND CONSTRUCTION GUIDE"
 - 4) ADDITIONAL SPECIFICATIONS SHALL BE AS NOTED ON THESE PLANS

CONTRACTOR'S RESPONSIBILITIES
CONTRACTOR SHALL BE KNOWLEDGABLE WITH LOCAL, CITY, COUNTY, STATE, AND FEDERAL REGULATIONS AS THEY MAY PERTAIN TO THIS DEVELOPMENT AND SHALL ADHERE TO THESE REGULATIONS.

UNDERGROUND UTILITIES
INFORMATION REGARDING THE PRESENCE, SIZE, CHARACTER AND LOCATION OF ANY UNDERGROUND UTILITIES AND/OR STRUCTURES SHOWN ON THIS PLAN ARE APPROXIMATE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO HAVE ALL UNDERGROUND UTILITIES LOCATED.

PURPOSE OF ISSUE: BID SET

NO.	DATE	DESCRIPTION	SHEETS AFFECTED	BY

SHEET INDEX

DESCRIPTION	SHEET
COVER SHEET	1
GENERAL NOTES	2
EXISTING CONDITIONS AND DEMO	3
EROSION AND SEDIMENT CONTROL PLAN	4
SITE PLAN	5
GRADING AND DRAINAGE PLAN	6
DETAILS	7-11
LANDSCAPING	L1.01-L1.02
COMBINATION SURVEY (BY CRESCENT MOON LAND SURVEY)	

SHEET 1 OF 11

Drawing name: Z:\2020 Projects\SC20-101 HCS Records Center Survey Backup\Design\Design\CAD Drawings\Construction Sheets\C1-COVER SHEET.dwg COVER SHEET Jun 02, 2020 4:52pm by: rlpby

ECLS GLOBAL
U.S. Veteran-Owned
19 N. McKINLEY ST.
COATS, NC 27021
910.897.2323 (fax) 910.897.2323 (cell)

REVISIONS:

NO.	DATE	DESCRIPTION

CHECKED BY: MBS

COVER SHEET
PROPANE BUS FUELING STATION & CDL TRAINING PAD
HORRY COUNTY SCHOOLS
HORRY COUNTY SOUTH CAROLINA

PROJ. NO.:	SC20-101
DESIGNED BY:	MBS/PTP
DRAWN BY:	PTP
SCALE:	NTS
DATE:	06-03-2020

ECLS

GRADING AND DRAINAGE

- 1) ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THESE PLANS, HORRY COUNTY SPECIFICATIONS AND SCDHEC-OCRM STANDARDS.
2) THE CONTRACTOR SHALL FIELD VERIFY THE HORIZONTAL AND VERTICAL LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO START OF CONSTRUCTION AND SHALL NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER OF ANY CONFLICTS THEY DISCOVER. SHOULD THE CONTRACTOR PROCEED WITH CONSTRUCTION PRIOR TO DOING THIS AND ANY CONFLICTS OCCUR THEN THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR THE TOTAL COST TO REMEDY THE SITUATION INCLUDING THE ENGINEERING FEES. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING EXISTING UTILITIES (SHOWN OR NOT SHOWN) WITHIN THE SCOPE OF CONSTRUCTION. IF ANY EXISTING UTILITIES ARE DAMAGED THE CONTRACTOR SHALL REPAIR THEM AT THEIR OWN EXPENSE.
3) THE CONTRACTOR SHALL MAINTAIN ADEQUATE SITE DRAINAGE DURING ALL PHASES OF CONSTRUCTION. THE CONTRACTOR SHALL USE SILT FENCES (OR OTHER METHODS APPROVED BY THE ENGINEER - HORRY COUNTY AND OCRM AS REQUIRED TO PREVENT SILT AND CONSTRUCTION DEBRIS FROM MIGRATING ONTO ADJACENT PROPERTIES. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL EROSION, CONSERVATION, AND SITUATION ORDINANCES. CONTRACTOR SHALL REMOVE ALL TEMPORARY EROSION CONTROL DEVICES UPON COMPLETION OF PERMANENT DRAINAGE FACILITIES AND THE ESTABLISHMENT OF A STAND OF GRASS OR OTHER GROWTH TO PREVENT EROSION, PER INSPECTION AND APPROVAL OF THE CERTIFIED SWPPP INSPECTOR
4) BEFORE ANY EARTHWORK IS DONE, THE CONTRACTOR SHALL STAKE OUT AND FLAG THE CLEARING LIMITS AND OTHER ITEMS ESTABLISHED BY THE PLANS. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY ENGINEERING AND SURVEYING FOR LINE AND GRADE CONTROL POINTS RELATED TO EARTHWORK.
5) CLEARING LIMITS SHALL BE, AT A MINIMUM, THE CLEARING REQUIRED IN ORDER TO FACILITATE THE WORK, OR TO PROVIDE FOR ADDITIONAL UTILITIES OR EASEMENTS AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
6) EXISTING CONTOURS AS SHOWN ON THIS PLAN WERE TAKEN FROM A FIELD TOPOGRAPHIC SURVEY PREPARED BY ECLS GLOBAL INC., CONTRACTOR SHALL CONTACT AND REFERENCE SAME BENCHMARK AS USED BY SURVEYOR.
7) GRADING CONTRACTOR SHALL COORDINATE WITH THE UTILITY COMPANIES FOR ANY AND ALL REQUIRED UTILITY ADJUSTMENTS AND/OR RELOCATIONS.
8) CONTRACTOR IS RESPONSIBLE FOR HAVING, IN HIS POSSESSION, ALL REQUIRED PERMITS AND APPROVALS PRIOR TO START OF CONSTRUCTION.
9) REFER TO PLAN SHEETS FOR EROSION CONTROL DEVICES TO BE INSTALLED PRIOR TO COMMENCING CONSTRUCTION.
10) NO TREE SHALL BE REMOVED OR DAMAGED WITHOUT PRIOR AUTHORIZATION OF THE OWNER OR OWNER'S REPRESENTATIVE. EXISTING TREES TO BE SAVED AS SHOWN ON THE DRAWINGS SHALL BE PRESERVED.
11) CONTRACTOR IS RESPONSIBLE FOR PROPERLY DISPOSING OF UNSUITABLE MATERIAL. ALL SUITABLE MATERIAL SHALL BE STOCKPILED AT OWNERS DIRECTION.
12) ALL EXCAVATION IS UNCLASSIFIED AND SHALL INCLUDE ALL MATERIALS ENCOUNTERED. UNUSABLE EXCAVATED MATERIAL AND ALL WASTE RESULTING FROM SITE CLEARING AND GRUBBING SHALL BE DISPOSED OF OFF-SITE BY THE CONTRACTOR AT HIS EXPENSE.
13) THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SITE SAFETY DURING ALL PHASES OF CONSTRUCTION.
14) ALL DRAINAGE PIPE SHALL BE CLASS III RCP PER SECTION 714 OF SCDOT STANDARD SPECIFICATIONS, UNLESS OTHERWISE NOTED.
15) RCP DENOTES REINFORCED CONCRETE PIPE, CLASS III UNLESS OTHERWISE NOTED.
16) CPP DENOTES CORRUGATED PLASTIC PIPE MEETING AASTO M294.
17) FOR PIPE JOINTS, CATCH BASINS AND ALL OTHER DRAINAGE STRUCTURES CONTRACTOR TO USE TYPE M OR S MORTAR.
18) JUTE MATTING MUST BE INSTALLED ON ANY SLOPE GREATER THAN 3:1 TO ENSURE SLOPE STABILITY.
19) THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING FINAL RECORD DRAWINGS IN A DIGITAL FORMAT FOR THE ENGINEERS SIGNATURE AND PREPARED BY A PROFESSIONAL LICENSED SURVEYOR SUITABLE FOR SUBMITTAL TO HORRY COUNTY SHOWING THE LOCATION OF INFRASTRUCTURE IN STATE PLANE COORDINATES AND ANY DEVIATIONS FROM PLANS MADE DURING CONSTRUCTION.
20) CONTRACTOR TO FILE FOR NOTICE OF TERMINATION (NOT) AND FINAL INSPECTION WITH HORRY COUNTY STORMWATER.

GENERAL NOTES

- 1) CONTRACTOR IS FULLY RESPONSIBLE FOR THE COORDINATION OF THE DIFFERENT PARTS OF THE PROJECT AND HOW THEY FIT TOGETHER. FAILURE TO COORDINATE BY THE GENERAL CONTRACTOR WILL NOT BE REASON FOR CHANGE ORDER FOR WORK THAT HAS TO BE REDONE.
2) THE CONTRACTOR SHALL COORDINATE PLAN SHEETS WITH DETAIL SHEETS. THERE ARE ITEMS SHOWN ON THE DETAIL SHEETS THAT ARE REQUIRED BUT ARE NOT NECESSARILY SHOWN ON THE PLAN SHEETS AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THESE ITEMS AND MAKE SURE THEY GET INSTALLED.
3) CONTRACTOR WILL BE FULLY RESPONSIBLE FOR KEEPING EXISTING FACILITIES IN FULL SERVICE WHILE HE COMPLETES HIS WORK SHOULD WORK NEED TO BE DONE THAT WOULD REQUIRE THE SHUTDOWN OF SUCH FACILITIES, THEN IT SHALL BE DONE AFTER HOURS, AT NIGHT, OR ON WEEKENDS AT NO ADDITIONAL COST TO THE OWNER.
4) THERE ARE SEVERAL COMPONENTS THAT COMPRISE THIS PROJECT AND EACH ARE RELATIVE TO HOW THE PROJECT IS TO BE BUILT. THESE ARE THE CONSTRUCTION PLANS, THE CONSTRUCTION DETAILS, THE SPECIFICATIONS, AND SOILS REPORT, WHEN PROVIDED. FAILURE BY THE CONTRACTOR TO COORDINATE ALL OF THESE ITEMS MAY RESULT IN WORK THAT HAS TO BE REMOVE AND REDONE AT THE CONTRACTORS SOLE EXPENSE.
5) THE MATERIALS SPECIFIED SHALL BE NEW AND OF THE QUALITY CALLED OUT IN THE DRAWINGS AND SPECIFICATIONS. THE CONTRACTOR SHALL PROVIDE THE EXACT MATERIALS AND PLACE THEM IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND REGULATORY AGENCY REQUIREMENTS.
6) REFERENCE TO REGULATORY REQUIREMENTS AND SPECIFICATIONS SHALL MEAN THEY ARE AS MUCH A PART OF THIS DESIGN AS THOSE THAT ARE IN THE PLANS AND SPECS AND SHALL BE FOLLOWED AS IF THEY WERE FULLY ENUMERATED IN THOSE DOCUMENTS. IF THERE IS A CONFLICT BETWEEN THESE DOCUMENTS AND THOSE OF THE REGULATORY AGENCY, THEN THE MORE RESTRICTIVE OF THE TWO SHALL GOVERN THE CONSTRUCTION UNLESS THE REQUIREMENTS ARE WAIVED BY THE OWNER BY PROVIDING A LETTER FROM THE OWNER EXCEPTING DEVIATION FROM THE PLANS AND ASSUMING ALL RISKS ASSOCIATED THERE WITH THE USE OF SUCH DEVIATIONS.
7) THE EXECUTION OF A CONTRACT SHALL BE CONCLUSIVE EVIDENCE THAT THE CONTRACTOR HAS INVESTIGATED THE SITE AND IS SATISFIED AS TO THE CONDITIONS TO BE ENCOUNTERED, AS TO THE CHARACTER, QUALITY, AND QUANTITIES OF WORK TO BE PERFORMED AND MATERIALS TO BE FURNISHED, AND AS TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

EROSION CONTROL NOTES

- 1) IF NECESSARY, SLOPES, WHICH EXCEED EIGHT (8) VERTICAL FEET SHOULD BE STABILIZED WITH SYNTHETIC OR VEGETATIVE MATS, IN ADDITION TO HYDROSEEDING. IT MAY BE NECESSARY TO INSTALL TEMPORARY SLOPE DRAINS DURING CONSTRUCTION. TEMPORARY BERMS MAY BE NEEDED UNTIL THE SLOPE IS BROUGHT TO GRADE.
2) STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICABLE IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN FOURTEEN (14) DAYS AFTER WORK HAS CEASED, EXCEPT AS STATED BELOW.
A) WHERE STABILIZATION BY THE 14TH DAY IS PRECLUDED BY SNOW COVER OR FROZEN GROUND CONDITIONS STABILIZATION MEASURES MUST BE INITIATED AS SOON AS PRACTICABLE.
B) WHERE CONSTRUCTION ACTIVITY ON A PORTION OF THE SITE IS TEMPORARILY CEASED, AND EARTH-DISTURBING ACTIVITIES WILL BE RESUMED WITHIN 14 DAYS, TEMPORARY STABILIZATION MEASURES DO NOT HAVE TO BE INITIATED ON THAT PORTION OF THE SITE.
3) ALL SEDIMENT AND EROSION CONTROL DEVICES SHALL BE INSPECTED ONCE EVERY CALENDAR WEEK BY AN SCDHEC SWPPP CERTIFIED INSPECTOR. IF PERIODIC INSPECTION OR OTHER INFORMATION INDICATES THAT A BMP. HAS BEEN INSTALLED INAPPROPRIATELY OR INCORRECTLY INSTALLED, THE PERMITEE MUST ADDRESS THE NECESSARY REPLACEMENT OR MODIFICATION REQUIRED TO CORRECT THE BMP WITHIN 48 HOURS OF IDENTIFICATION.
4) PROVIDE SILT FENCE AND/OR OTHER CONTROL DEVICES, AS MAY BE REQUIRED, TO CONTROL SOIL EROSION DURING UTILITY CONSTRUCTION. ALL DISTURBED AREAS SHALL BE CLEANED, GRADED, AND STABILIZED WITH GRASSING IMMEDIATELY AFTER THE UTILITY INSTALLATION. FILL, COVER, AND TEMPORARY SEEDING AT THE END OF EACH DAY ARE RECOMMENDED. IF WATER IS ENCOUNTERED WHILE TRENCHING, THE WATER SHOULD BE FILTERED TO REMOVE SEDIMENT BEFORE BEING PUMPED BACK INTO ANY WATERS OF THE STATE.
5) ALL EROSION CONTROL DEVICES SHALL BE PROPERLY MAINTAINED DURING ALL PHASES OF CONSTRUCTION UNTIL THE COMPLETION OF ALL CONSTRUCTION ACTIVITIES AND ALL DISTURBED AREAS HAVE BEEN STABILIZED. ADDITIONAL CONTROL DEVICES MAY BE REQUIRED DURING CONSTRUCTION IN ORDER TO CONTROL EROSION AND/OR OFFSITE SEDIMENTATION. ALL TEMPORARY CONTROL DEVICES SHALL BE REMOVED ONCE CONSTRUCTION IS COMPLETE AND THE SITE IS STABILIZED.
6) THE CONTRACTOR MUST TAKE NECESSARY ACTION TO MINIMIZE THE TRACKING OF MUD ONTO PAVED ROADWAY(S) FROM CONSTRUCTION AREAS AND THE GENERATION OF DUST. THE CONTRACTOR SHALL DAILY REMOVE MUD/SOIL FROM PAVEMENT, AS MAY BE REQUIRED.
7) TEMPORARY DIVERSION BERMS AND/OR DITCHES WILL BE UTILIZED, AS NEEDED, DURING CONSTRUCTION TO PROTECT WORK AREAS FROM UPSLOPE RUNOFF AND/OR TO DIVERT SEDIMENT-LADEN WATER TO APPROPRIATE TRAPS OR STABLE OUTLETS.
8) ALL WATERS OF THE STATE (WOS), INCLUDING WETLANDS, ARE TO BE FLAGGED OR OTHERWISE CLEARLY MARKED IN THE FIELD. A DOUBLE ROW OF SILT FENCE IS TO BE INSTALLED IN ALL AREAS WHERE A 50-FOOT BUFFER CAN'T BE MAINTAINED BETWEEN THE DISTURBED AREA AND ALL WOS. A 10-FOOT BUFFER SHOULD BE MAINTAINED BETWEEN THE LAST ROW OF SILT FENCE AND ALL WOS.
9) LITTER, CONSTRUCTION DEBRIS, OILS, FUELS, AND BUILDING PRODUCTS WITH SIGNIFICANT POTENTIAL FOR IMPACT (SUCH AS STOCKPILES OF FRESHLY TREATED LUMBER) AND CONSTRUCTION CHEMICALS THAT COULD BE EXPOSED TO STORM WATER MUST BE PREVENTED FROM BECOMING A POLLUTANT SOURCE IN STORM WATER DISCHARGES.
10) A COPY OF THE SWPPP, INSPECTIONS RECORDS, AND RAINFALL DATA MUST BE RETAINED AT THE CONSTRUCTION SITE OR A NEARBY LOCATION EASILY ACCESSIBLE DURING NORMAL BUSINESS HOURS, FROM THE DATE OF COMMENCEMENT OF CONSTRUCTION ACTIVITIES TO THE DATE THAT FINAL STABILIZATION IS REACHED.
11) INITIATE STABILIZATION MEASURES ON ANY EXPOSED STEEP SLOPE (3H:1V OR GREATER) WHERE LAND-DISTURBING ACTIVITIES HAVE PERMANENTLY OR TEMPORARILY CEASED, AND WILL NOT RESUME FOR A PERIOD OF 7 CALENDAR DAYS.
12) MINIMIZE SOIL COMPACTION AND, UNLESS INFEASIBLE, PRESERVE TOPSOIL.
13) MINIMIZE THE DISCHARGE OF POLLUTANTS FROM EQUIPMENT AND VEHICLE WASHING, WHEEL WASH WATER, AND OTHER WASH WATERS. WASH WATERS MUST BE TREATED IN A SEDIMENT BASIN OR ALTERNATIVE CONTROL THAT PROVIDES EQUIVALENT OR BETTER TREATMENT PRIOR TO DISCHARGE
14) MINIMIZE THE DISCHARGE OF POLLUTANTS FROM DEWATERING OF TRENCHES AND EXCAVATED AREAS. THESE DISCHARGES ARE TO BE ROUTED THROUGH APPROPRIATE BMPS (SEDIMENT BASIN, FILTER BAG, ETC.).
15) THE FOLLOWING DISCHARGES FROM SITES ARE PROHIBITED:
A) WASTEWATER FROM WASHOUT OF CONCRETE, UNLESS MANAGED BY AN APPROPRIATE CONTROL;
B) WASTEWATER FROM WASHOUT AND CLEANOUT OF STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS AND OTHER CONSTRUCTION MATERIALS;
C) FUELS, OILS, OR OTHER POLLUTANTS USED IN VEHICLE AND EQUIPMENT OPERATION AND MAINTENANCE; AND
D)SOAPS OR SOLVENTS USED IN VEHICLE AND EQUIPMENT WASHING.
16) AFTER CONSTRUCTION ACTIVITIES BEGIN, INSPECTIONS MUST BE CONDUCTED AT A MINIMUM OF AT LEAST ONCE EVERY CALENDAR WEEK AND MUST BE CONDUCTED UNTIL FINAL STABILIZATION IS REACHED ON ALL AREAS OF THE CONSTRUCTION SITE.
17) IF EXISTING BMPS NEED TO BE MODIFIED OR IF ADDITIONAL BMPS ARE NECESSARY TO COMPLY WITH THE REQUIREMENTS OF THIS PERMIT AND/OR SOUTH CAROLINA'S WATER QUALITY STANDARDS, IMPLEMENTATION MUST BE COMPLETED BEFORE THE NEXT STORM EVENT WHENEVER PRACTICABLE. IF IMPLEMENTATION BEFORE THE NEXT STORM EVENT IS IMPRACTICABLE, THE SITUATION MUST BE DOCUMENTED IN THE SWPPP AND ALTERNATIVE BMPS MUST BE IMPLEMENTED AS SOON AS REASONABLY POSSIBLE.
18) A PRE-CONSTRUCTION CONFERENCE MUST BE HELD FOR EACH CONSTRUCTION SITE WITH AN APPROVED ON-SITE SWPPP PRIOR TO THE IMPLEMENTATION OF CONSTRUCTION ACTIVITIES. FOR NON-LINEAR PROJECTS THAT DISTURB 10 ACRES OR MORE, THIS CONFERENCE MUST BE HELD ON-SITE UNLESS SCDHEC HAS APPROVED OTHERWISE.

PAVING

- 1) ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THESE PLANS, SCDOT STANDARD SPECIFICATIONS, LATEST EDITION, AND HORRY COUNTY SPECIFICATIONS.
2) UPON COMPLETION OF PAVING, CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PAVEMENT CORE DATA AS REQUESTED BY HORRY COUNTY OR THE ENGINEER.
3) PRIME COAT AND TACK COAT APPLICATION TO BE IN ACCORDANCE WITH SCDOT STANDARD SPECIFICATIONS.
4) CONTRACTOR SHALL COORDINATE WITH GEOTECHNICAL ENGINEER & OWNER PRIOR TO BEGINNING OF PAVING. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING A 3RD PARTY TESTING AGENT TO BE PRESENT FOR ALL PARTIES.

PAVEMENT MARKING

- 1) ALL SIGNS, PAVEMENT MARKINGS, AND OTHER TRAFFIC CONTROL DEVICES ON PUBLIC STREETS SHALL CONFORM TO THE SCDOT STANDARDS/FOR ROADWAY CONSTRUCTION AND THE SC SUPPLEMENTAL NATIONAL MUTCD (CURRENT EDITION) & THE NMUTCD (CURRENT EDITION) FOR HIGHWAY CONSTRUCTION.
2) UNLESS OTHERWISE DIRECTED, PAVEMENT MARKINGS SHALL BE PAINT OR AS DIRECTED BY THE OWNER. PAVEMENT MARKINGS ON OR WITHIN PUBLIC STREETS SHALL BE THERMOPLASTIC. PAINT IS PERMITTED FOR INITIAL PAVEMENT MARKINGS WITHIN PUBLIC STREETS.
3) ALL STRIPING/MARKING MATERIALS SHALL CONFORM TO SCDOT STANDARD SPECIFICATIONS, LATEST EDITION.
4) ALL STOP BARS AND ARROWS ARE TO BE THERMOPLASTIC.

CONSTRUCTION SEQUENCE

- 1) OBTAIN GRADING PERMIT AND LAND DISTURBANCE PERMIT
2) PRE-CONSTRUCTION MEETING WITH HORRY COUNTY & ENGINEER.
3) MOBILIZATION ON-SITE
4) COORDINATE WITH ENGINEER TO SET BENCHMARKS
5) INSTALL CONSTRUCTION ENTRANCE, SILT FENCING AND TREE PROTECTION. CLEAR ONLY AS NECESSARY TO INSTALL THESE DEVICES. INSTALL SILT FENCE IN CONJUNCTION WITH CLEARING PRIOR TO GRUBBING.
6) CALL FOR ON-SITE INSPECTION BY ENGINEERING INSPECTOR. AFTER APPROVAL, BEGIN CLEARING AND GRUBBING.
7) DEMOLITION OF EXISTING FACILITIES, IF ANY.
8) INSTALL NEW STORMWATER DRAINAGE SYSTEM, INCLUDING INLET PROTECTION.
9) MAINTAIN EROSION CONTROL DEVICES, AS NEEDED.
10) STABILIZE SITE AS AREAS ARE BROUGHT UP TO FINISHED GRADE.
11) INSTALLATION OF CURB AND GUTTER.
12) FINISH GRADING / PAVING / PAVEMENT MARKINGS.
13) PLANT ALL DISTURBED AREAS.
14) REMOVAL OF SITE BMP'S, UPON CERTIFIED SWPPP INSPECTORS APPROVAL.
15) SITE CLEANUP / DEMOBILIZATION.

SEEDBED PREPARATION

- 1) CHISEL COMPACTED AREAS AND SPREAD TOPSOIL 3 INCHES DEEP OVER ADVERSE SOIL CONDITIONS.
2) RIP THE ENTIRE AREA TO 6 INCHES DEPTH.
3) REMOVE ALL LOSE ROCK, ROOTS, AND OTHER OBSTRUCTIONS LEAVING SURFACE REASONABLY SMOOTH AND UNIFORM.
4) APPLY AGRICULTURAL LIME, FERTILIZER, AND SUPERPHOSPHATE UNIFORMLY AND MIX WITH SOIL.
5) CONTINUE TILLAGE UNTIL A WELL-PULVERIZED, FIRM REASONABLY UNIFORM SEEDBED IS PREPARED 4 TO 6 INCHES DEEP.
6) HYDRO SEED ON A FRESHLY PREPARED SEEDBED AND COVER SEED LIGHTLY WITH SEEDING EQUIPMENT OR CULTIPACK AFTER SEEDING.
7) MULCH IMMEDIATELY AFTER SEEDING AND ANCHOR MULCH.
8) INSPECT ALL SEEDED AREAS AND MAKE NECESSARY REPAIRS OR RESEEDINGS WITHIN THE PLANTING SEASON. IF STAND SHOULD BE OVER 60% DAMAGED, REESTABLISH FOLLOWING ORIGINAL LIME, FERTILIZER AND SEEDING RATES.
9) CONSULT CONSTRUCTION INSPECTOR ON MAINTENANCE TREATMENT AND FERTILIZATION AFTER PERMANENT COVER IS ESTABLISHED.
10) SEEDING SHALL BE PERFORMED AS HYDRO SEEDING OPERATION.
* APPLY: AGRICULTURAL LIMESTONE - 2 TONS/ ACRES (3 TONS/ACRE IN CLAY SOILS)
FERTILIZER - 1,000 lbs. / ACRE -10-10-10
SUPERPHOSPHATE- 500 lbs> / ACRE -20% ANALYSIS
MULCH -2 TONS / ACRE - SMALL GRAIN STRAW
ANOTHER - ASPHALT EMULSION @ 300 GALS./ ACRE

- MANDATORY SAFETY AND CONDUCT REQUIREMENTS: THE SAFETY AND SECURITY OF DISTRICT STAFF, STUDENTS AND THE GENERAL PUBLIC ARE OF UTMOST PRIORITY TO THE DISTRICT. TO THAT END, THE CONTRACTOR SHALL ENSURE THE CONTRACTOR AND ALL SUBCONTRACTORS AND SUPPLIERS COMPLY WITH THE FOLLOWING:
A. NO DRUGS, ALCOHOL, KNIVES, FIREARMS OR OTHER WEAPONS ON THE WORKSITE, WHETHER OR NOT THERE IS AN EXISTING OCCUPIED BUILDING.
B. NO FRATERNIZING WITH, THREATS TO, OR USE OF ABUSIVE OR PROFANE LANGUAGE IN THE PRESENCE OF STUDENTS, PARENTS, VISITORS, ENGINEER OR DISTRICT REPRESENTATIVES, AGENTS, OR EMPLOYEES AT THE WORKSITE LOCATION.
C. NO IMPROPER ATTIRE OR ACTIONS WHILE ON ANY DISTRICT PREMISES.
D. NO SMOKING OR VAPING ON DISTRICT PREMISES.
E. NO DIRECT COMMUNICATION WITH BUILDING OCCUPANTS AT THE WORKSITE, INCLUDING THE PRINCIPAL, UNLESS AN EMERGENCY OCCURS.
F. TAKE ALL NECESSARY PRECAUTIONS TO SEPARATE WORKSITE ACTIVITIES FROM THE OCCUPIED PORTION OF ANY BUILDING AND SECURE ALL WORK AREAS AND EQUIPMENT WITH SAFETY FENCING AND APPROPRIATE SIGNAGE.
G. TAKE ALL NECESSARY PRECAUTIONS TO ENSURE MINIMAL LOSS OF UTILITIES, POWER AND OTHER FACILITIES REQUIRED BY THE OCCUPANTS OF AN EXISTING BUILDING AND CAUSE MINIMAL DISRUPTION OF THE EDUCATIONAL PROCESS.
H. SECURE SLED (STATE LAW ENFORCEMENT DIVISION) CRIMINAL BACKGROUND CHECKS ON ALL CONTRACTOR AND SUBCONTRACTOR EMPLOYEES, AGENTS, AND REPRESENTATIVES PERFORMING WORK AT THE WORKSITE SUCH THAT THE CONTRACTOR SHALL ENSURE NO PERSON HAVING COMMITTED VIOLENT CRIMES, CRIMES AGAINST CHILDREN, OR CRIMES OF MORAL TURPITUDE ARE ALLOWED ACCESS TO THE WORKSITE AND SUCH SLED CRIMINAL BACKGROUND CHECKS SHALL BE MADE AVAILABLE TO APPROPRIATE DISTRICT PERSONNEL OR THE DISTRICT'S LEGAL COUNSEL IMMEDIATELY UPON REQUEST.
I. TAKE ALL NECESSARY PRECAUTIONS TO PROTECT STUDENTS, PARENTS, VISITORS, ENGINEER AND DISTRICT REPRESENTATIVES, AGENTS, OR EMPLOYEES AS WELL AS THE PROPERTY BELONGING TO THOSE INDIVIDUALS AT THE WORKSITE LOCATION DURING THE CONTRACT TERM.
J. ENSURE THE CONTRACTOR'S AND SUBCONTRACTOR'S EMPLOYEES LOCATED AT THE WORKSITE, WHETHER FULL-TIME, PART-TIME, OR OCCASIONALLY EMPLOYED, WEAR PHOTO IDENTIFICATION TAGS SPECIFICALLY IDENTIFYING THEM AS PART OF THE CONTRACTOR'S OR SUBCONTRACTOR'S WORKFORCE AND MEETING THE DISTRICT'S REQUIREMENTS FOR IDENTIFICATION. FAILURE TO MEET THE REQUIREMENTS OF CONDUCT STATED IN THIS PARAGRAPH MAY RESULT IN ARREST AND/OR REMOVAL OF THE OFFENDING INDIVIDUAL(S) FROM THE WORKSITE, STOPPAGE OF THE WORK UNTIL CORRECTIVE ACTION IS TAKEN, OR ANY OTHER ACTION DEEMED EXPEDIENT BY THE DISTRICT NO INCREASE IN CONTRACT PRICE OR CHANGE IN CONTRACT TIME.
K. HORRY COUNTY SCHOOLS REQUIRED A CLEAN, NEAT AND SAFE SITE AT ALL TIMES - DAILY SITE CLEAN-UP IS REQUIRED.
L. NO ILLEGAL IMMIGRANTS OR CONVICTED FELONS ALLOWED ON HCS PROPERTY AT ANY TIME. A DAILY SIGN IN LOG WITH SLED CHECKS FOR ALL WORKERS ON THE JOB MUST BE KEPT ON FILE AVAILABLE ONSITE FOR EVERY WORKER ON THE JOB.

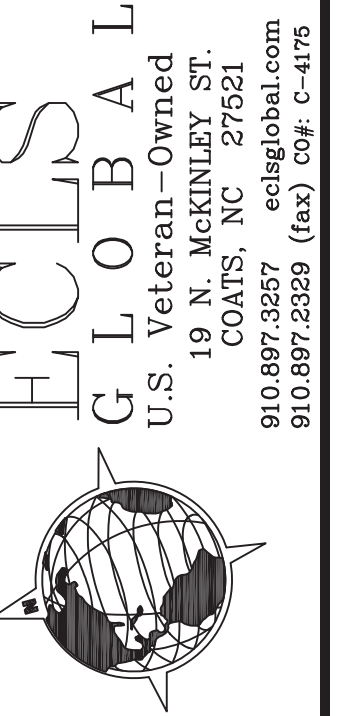
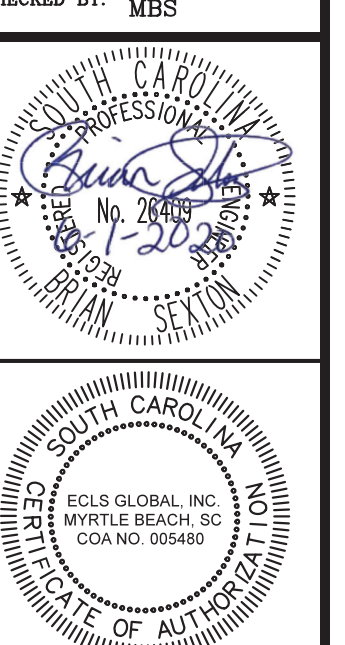


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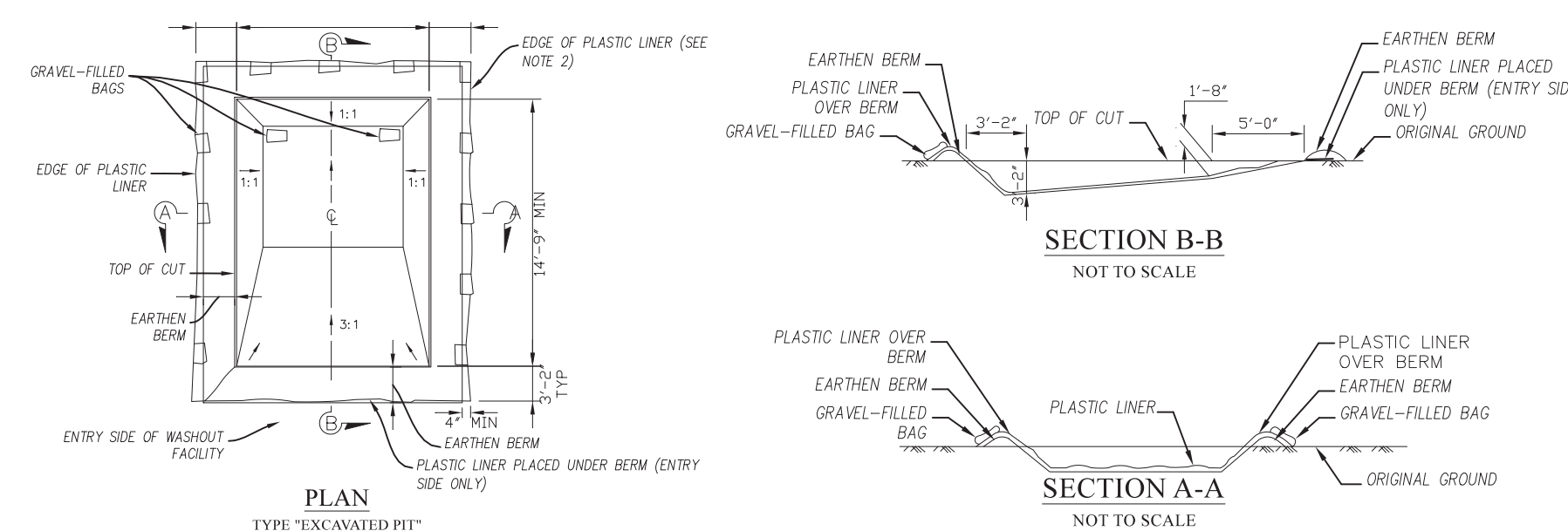
GENERAL NOTES
PROpane BUS FUELING STATION & CDL TRAINING PAD
FOR HORRY COUNTY SCHOOLS
HORRY COUNTY SOUTH CAROLINA

Table with 2 columns: PROJ. NO.: SC20-101, DESIGNED BY: MBS/PTP, DRAWN BY: PTP, SCALE: NTS, DATE: 06-03-2020

Drawing name: Z:\2020 Projects\SC20-101_HCS_Records_Center_Survey_Backup_Design\Design\CAD Drawings\Construction_Sheets\C2-GENERAL NOTES.dwg GENERAL NOTES Jun 02, 2020 4:52pm by: PTP

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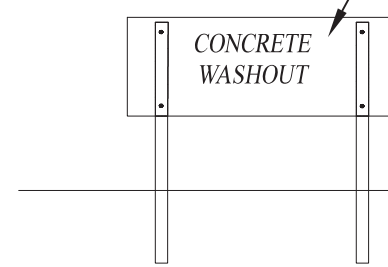
EXCAVATED PIT CONCRETE WASHOUT



NOTES:

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. INSTALL CONCRETE WASHOUT SIGN (24"X24", MINIMUM) WITHIN 30' OF THE TEMPORARY CONCRETE WASHOUT FACILITY.
3. TEMPORARY WASHOUT AREA MUST BE AT LEAST 50' FROM A STORM DRAIN, CREEK BANK OR PERIMETER CONTROL.
4. CLEAN OUT CONCRETE WASHOUT AREA WHEN 50% FULL.
5. THE KEY TO FUNCTIONAL CONCRETE WASHOUTS IS WEEKLY INSPECTIONS, ROUTINE MAINTENANCE, AND REGULAR CLEAN OUT.
6. SILT FENCE SHALL BE INSTALLED AROUND PERIMETER OF CONCRETE WASHOUT AREA EXCEPT FOR THE SIDE UTILIZED FOR ACCESSING THE WASHOUT.
7. A ROCK CONSTRUCTION ENTRANCE MAY BE NECESSARY ALONG ONE SIDE OF THE WASHOUT TO PROVIDE VEHICLE ACCESS.

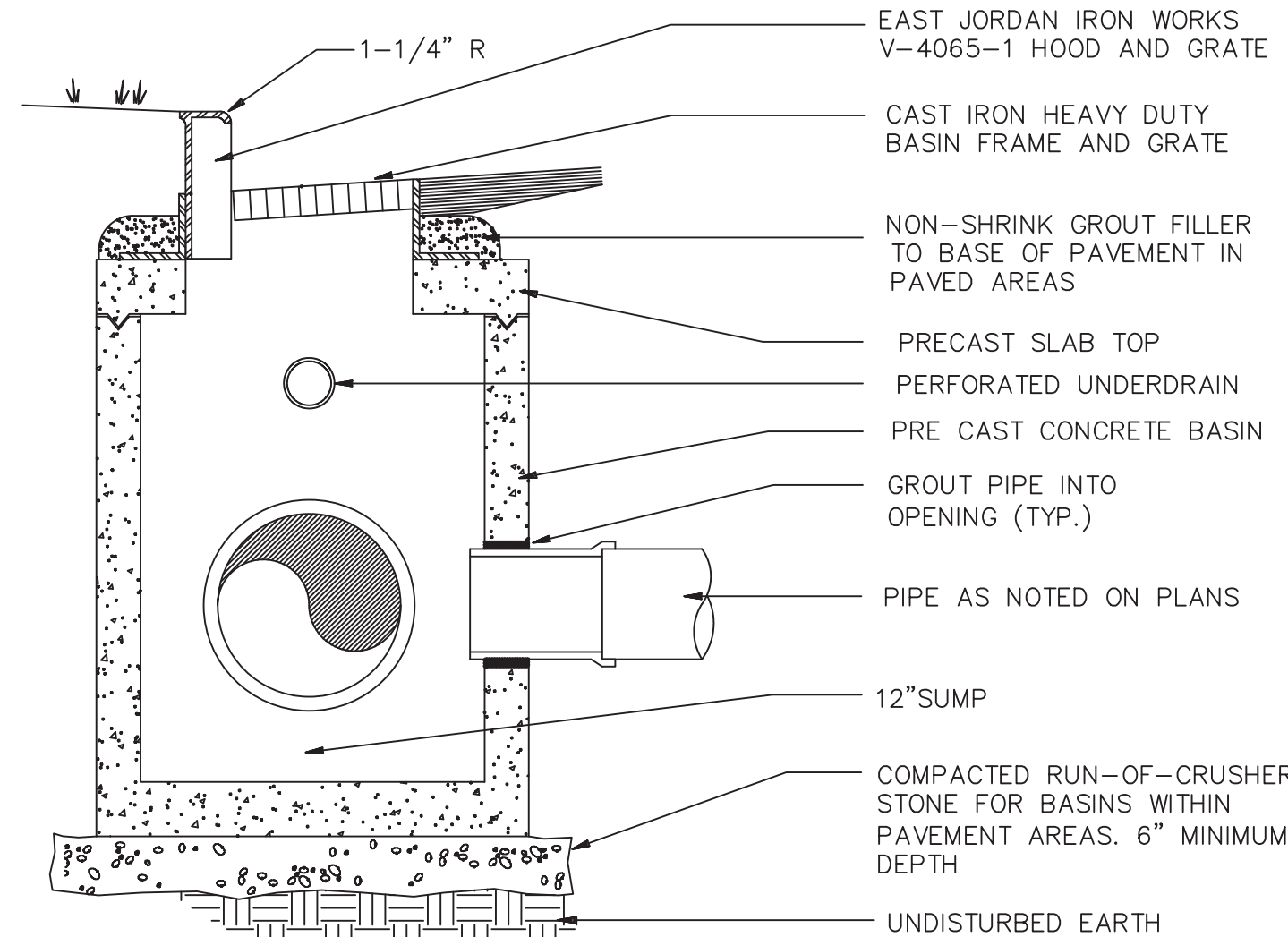
LETTERS A MINIMUM OF 5" IN HEIGHT



CONCRETE WASHOUT SIGN DETAIL

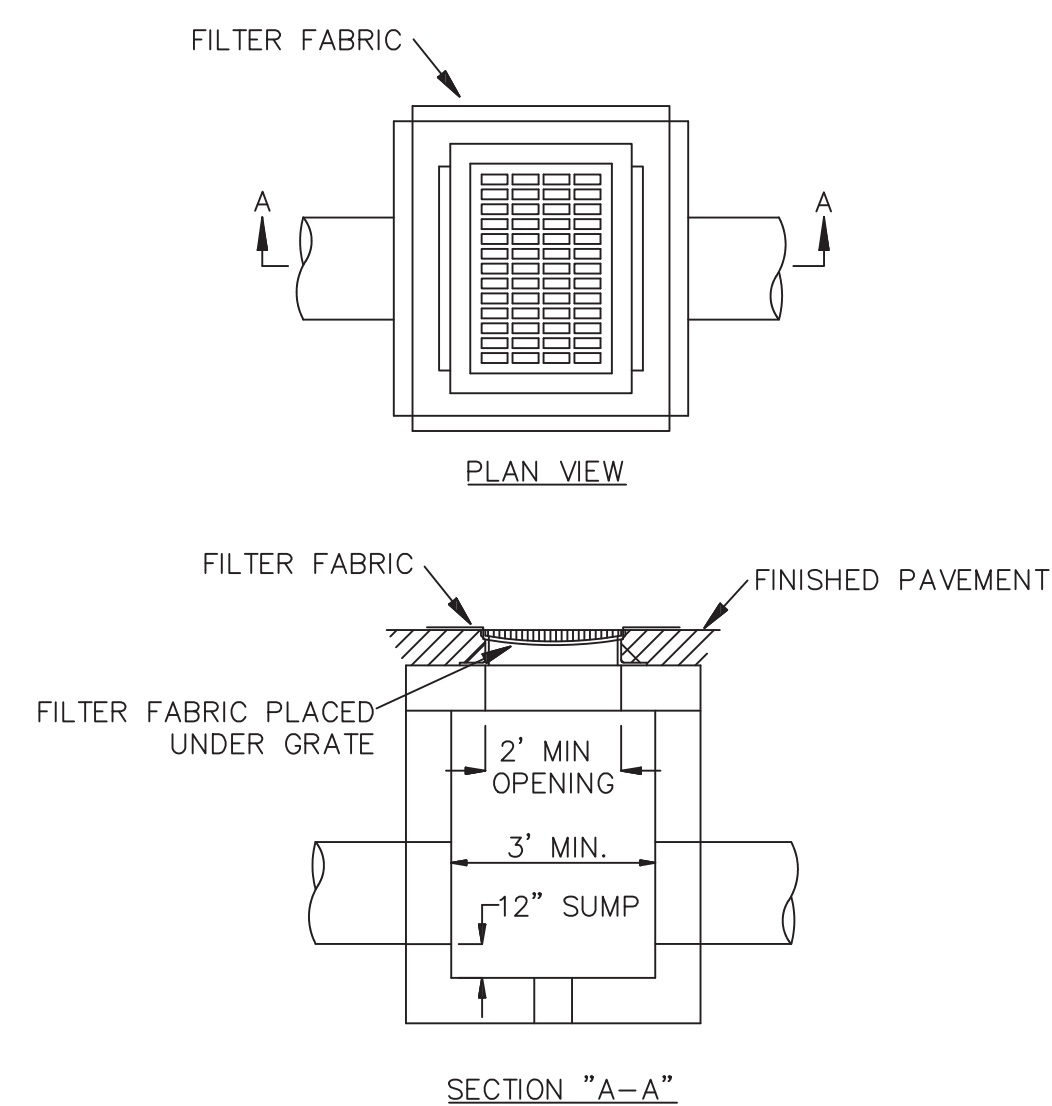
South Carolina Department of Health and Environmental Control
CONCRETE WASHOUT
 EXCAVATED PIT
 STANDARD DRAWING NO. RC-08 PAGE 1 of 1
 NOT TO SCALE FEBRUARY 2014 DATE

CURB INLET
NOT TO SCALE

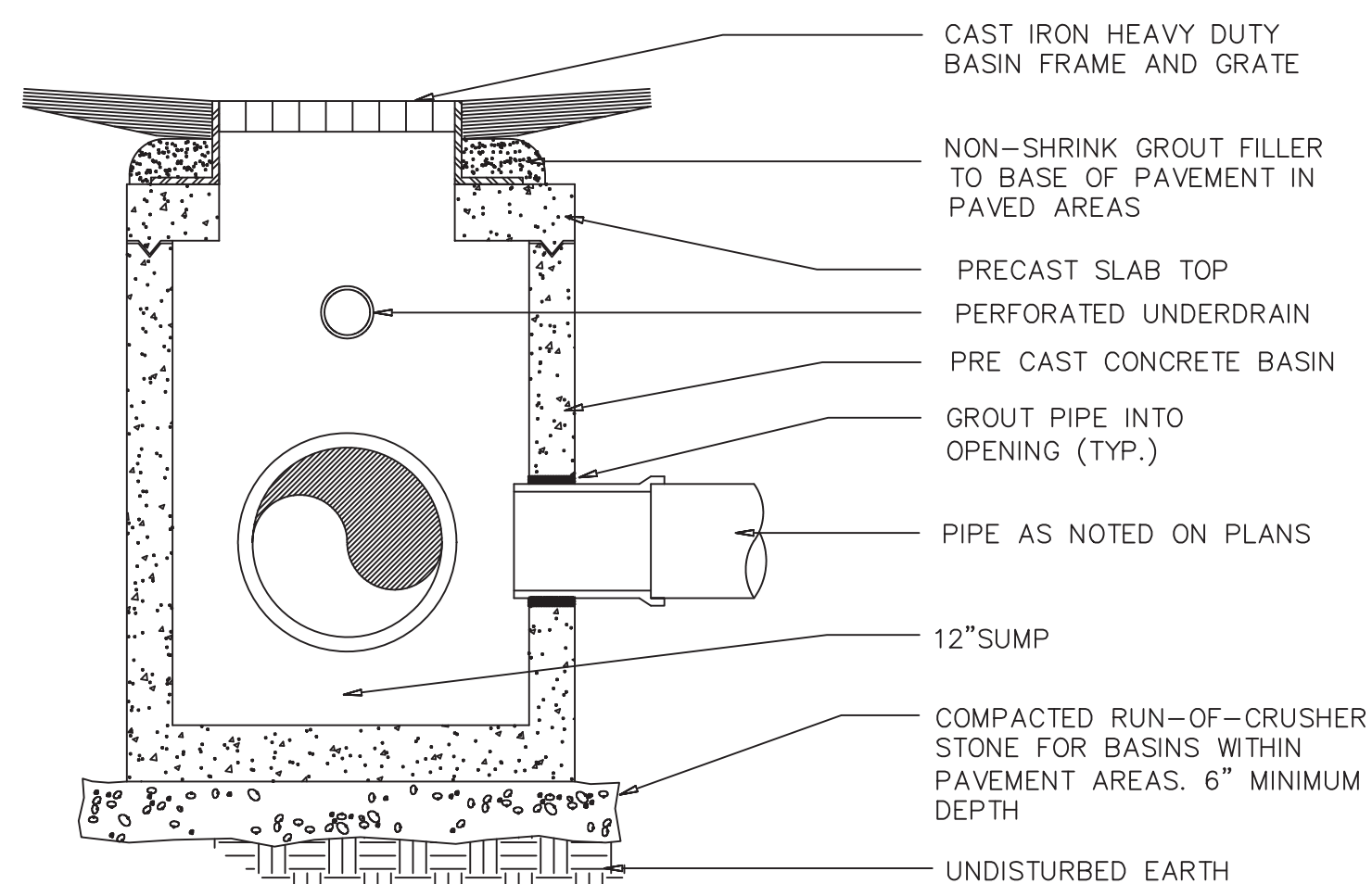


- NOTES:
1. ALL BASINS AND SLAB TOPS TO BE PRECAST AND DESIGNED FOR HS-20 LOAD RATING MINIMUM.
 2. BASINS SHALL HAVE 2'-6" X 3'-0" MINIMUM INSIDE DIMENSION, OR LARGER AS REQUIRED TO ACCEPT STORM PIPES.

INLET PROTECTION TYPE C
NOT TO SCALE

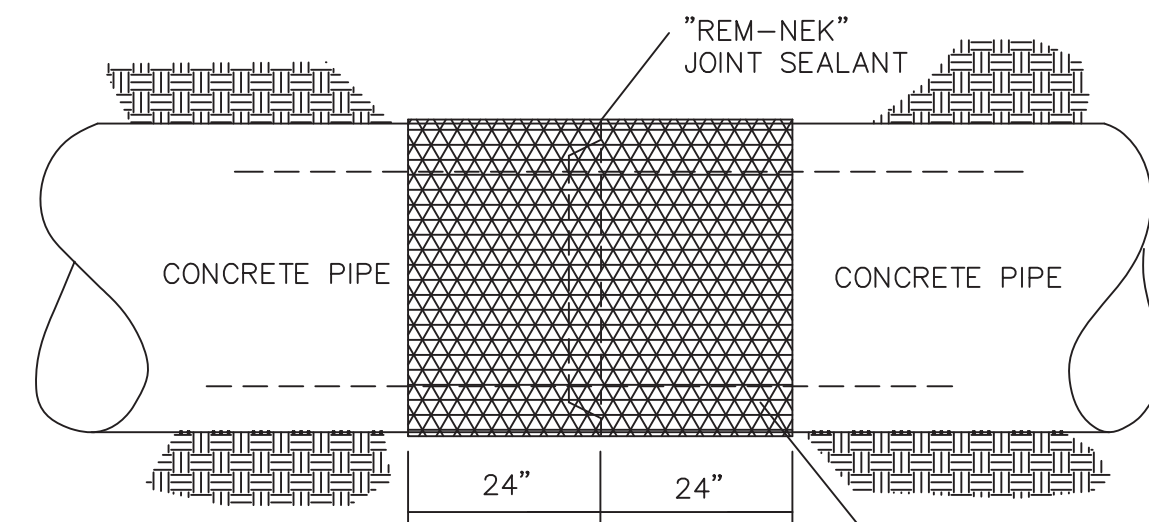


GRATE INLET
NOT TO SCALE



- NOTES:
1. ALL BASINS AND SLAB TOPS TO BE PRECAST AND DESIGNED FOR HS-20 LOAD RATING MINIMUM.
 2. BASINS SHALL HAVE 2'-6" X 3'-0" MINIMUM INSIDE DIMENSION, OR LARGER AS REQUIRED TO ACCEPT STORM PIPES.

CONCRETE PIPE JOINT DETAIL
NOT TO SCALE



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 COATS, NC 27521
 910.697.9257 ecsglobal.com
 910.697.9259 (fax) conf. C-4176

REVISIONS:

CHECKED BY: MBS

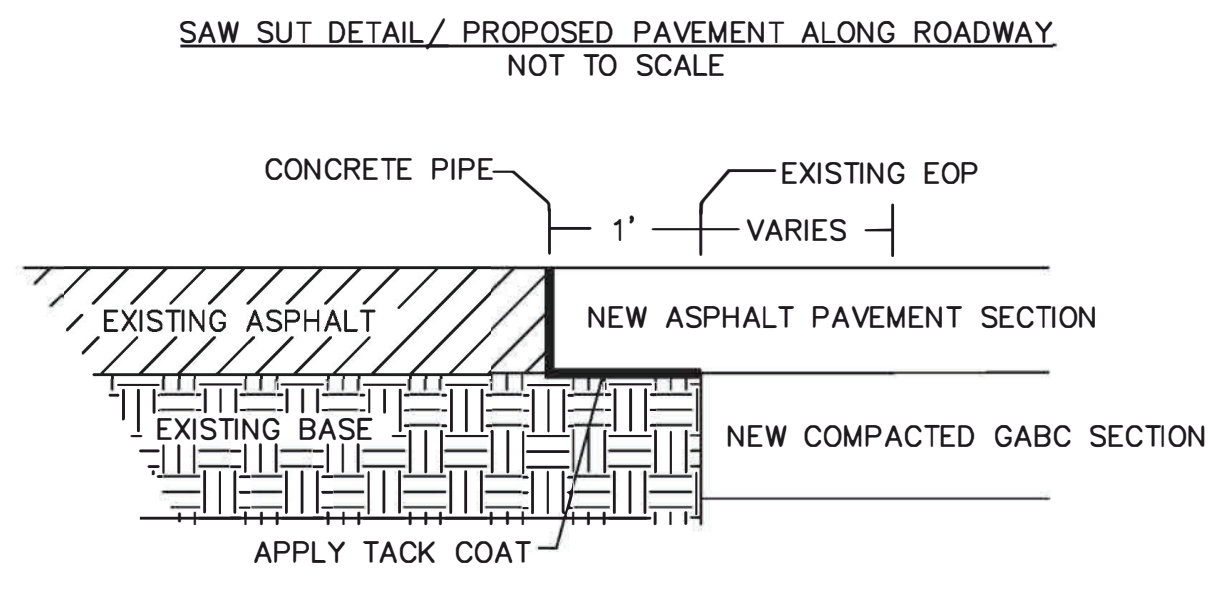


DETAILS 2
 PROPANE BUS FUELING STATION & CDL TRAINING PAD
 FOR
 Horry County Schools
 Horry County - South Carolina

PROJ. NO.: SC20-101
 DESIGNED BY: MBS/PTP
 DRAWN BY: PTP
 SCALE: NTS
 DATE: 06-03-2020

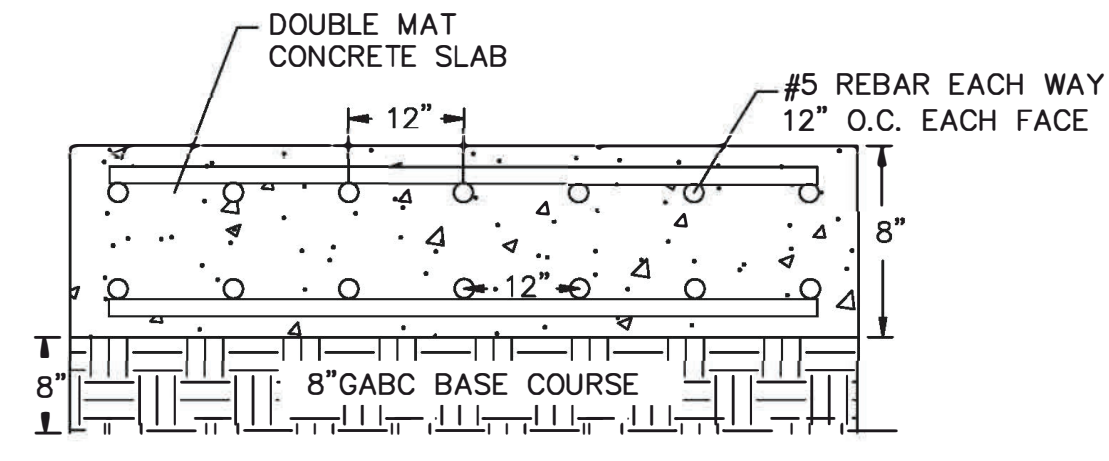
ECLS

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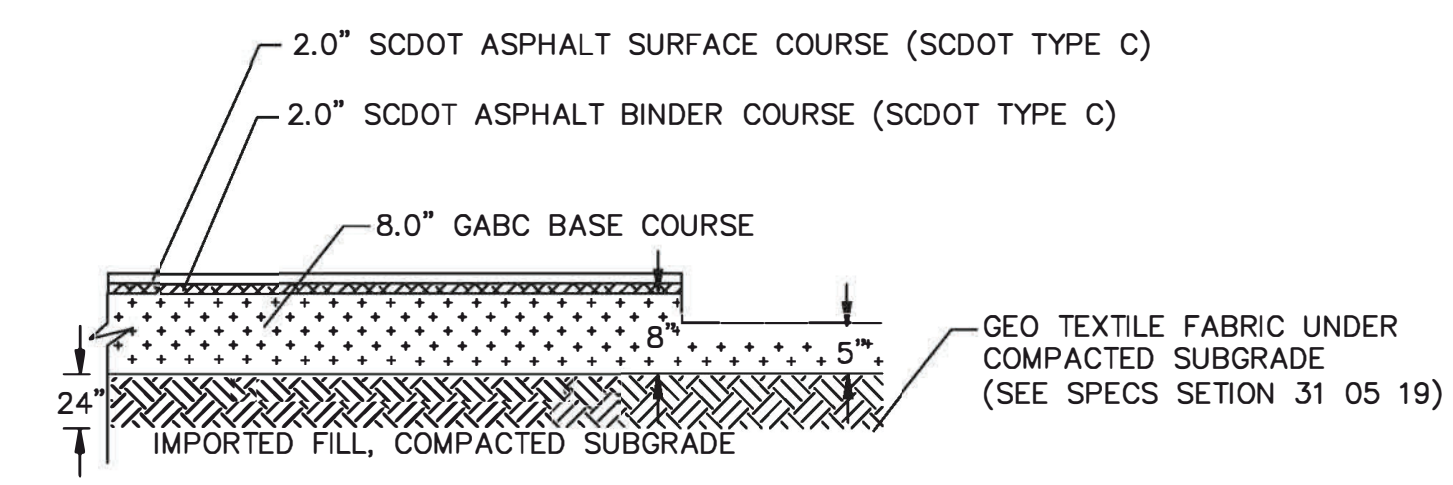


NOTE: COMPACT ALL MATERIALS PER THE GEOTECHNICAL REPORT

PROPANE TANK PAD NOT TO SCALE

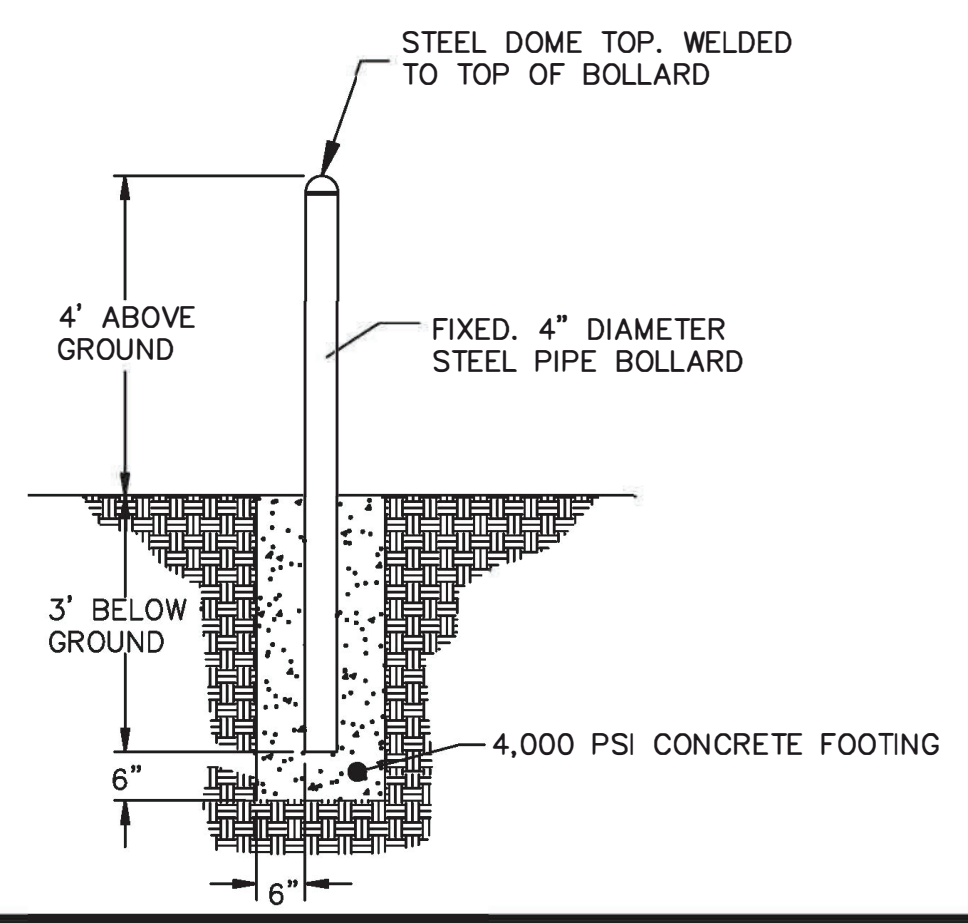


HEAVY DUTY FLEXIBLE PAVEMENT SECTION NOT TO SCALE

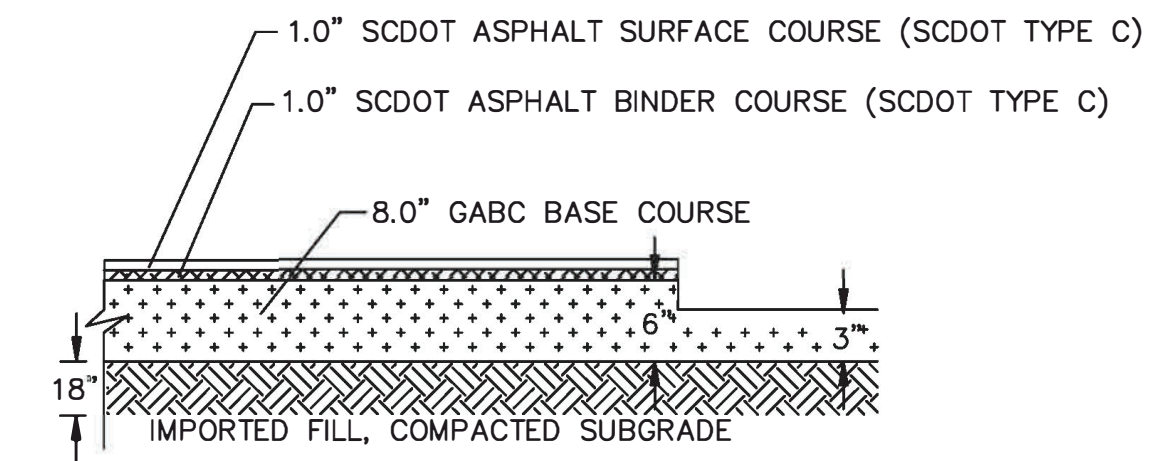


- NOTES:
1. ALL MATERIALS SHALL MEET APPLICABLE STANDARDS SET FORTH IN THE SCDOT CONSTRUCTION STANDARDS LATEST EDITION.
 2. SUBGRADE SHALL BE FREE OF ALL ROCKS AND DEBRIS LARGER THAN 1" DIAMETER AND SHALL BE COMPACTED TO 95% MODIFIED PROCTOR OVER APPROVED GEOTEXTILE. CERTIFIED COMPACTION TESTS MUST BE SUBMITTED TO THE ENGINEER PRIOR TO APPLICATION OF ANY BASE MATERIAL (TO BE DETERMINED IN THE FIELD BY THE ENGINEER).
 3. GABC SHALL BE COMPACTED TO 100% MODIFIED PROCTOR.
 4. CONTRACTOR TO REMOVE ALL TOPSOIL MATERIALS AND UNDERCUT 24" OF ADDITIONAL MATERIAL. IMPORT APPROVED FILL AND COMPACT TO 95% M.D.D. PER MODIFIED PROCTOR.

BOLLARD DETAIL NOT TO SCALE

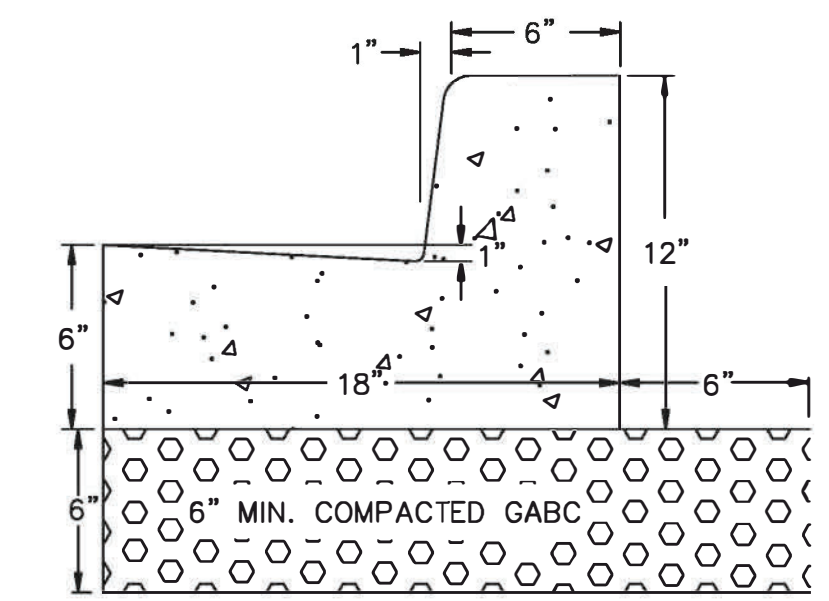


STANDARD DUTY FLEXIBLE PAVEMENT SECTION NOT TO SCALE

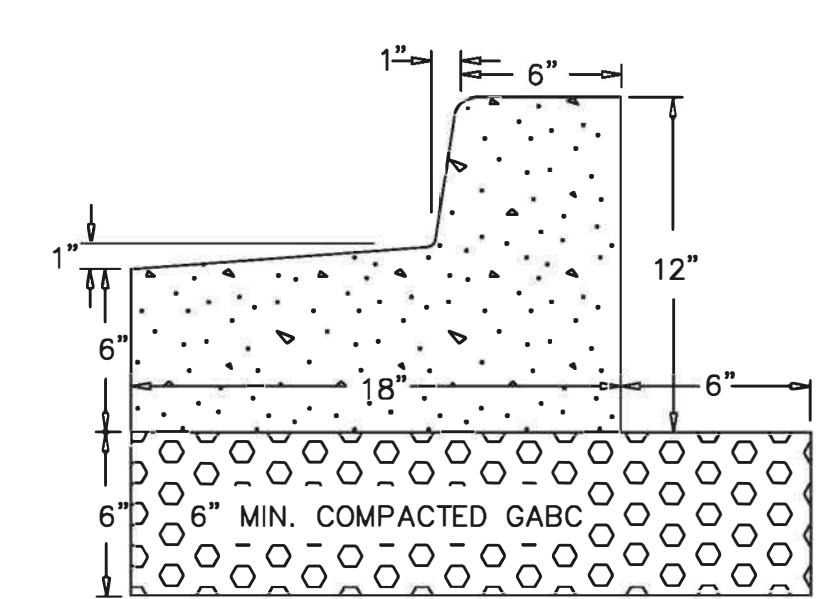


- NOTES:
1. ALL MATERIALS SHALL MEET APPLICABLE STANDARDS SET FORTH IN THE SCDOT CONSTRUCTION STANDARDS LATEST EDITION.
 2. SUBGRADE SHALL BE FREE OF ALL ROCKS AND DEBRIS LARGER THAN 1" DIAMETER AND SHALL BE COMPACTED TO 95% MODIFIED PROCTOR OVER APPROVED GEOTEXTILE. CERTIFIED COMPACTION TESTS MUST BE SUBMITTED TO THE ENGINEER PRIOR TO APPLICATION OF ANY BASE MATERIAL (TO BE DETERMINED IN THE FIELD BY THE ENGINEER).
 3. GABC SHALL BE COMPACTED TO 100% MODIFIED PROCTOR.
 4. CONTRACTOR TO REMOVE ALL TOPSOIL MATERIALS AND UNDERCUT 24" OF ADDITIONAL MATERIAL. IMPORT APPROVED FILL AND COMPACT TO 95% M.D.D. PER MODIFIED PROCTOR.

18" STANDARD CURB SECTION NOT TO SCALE

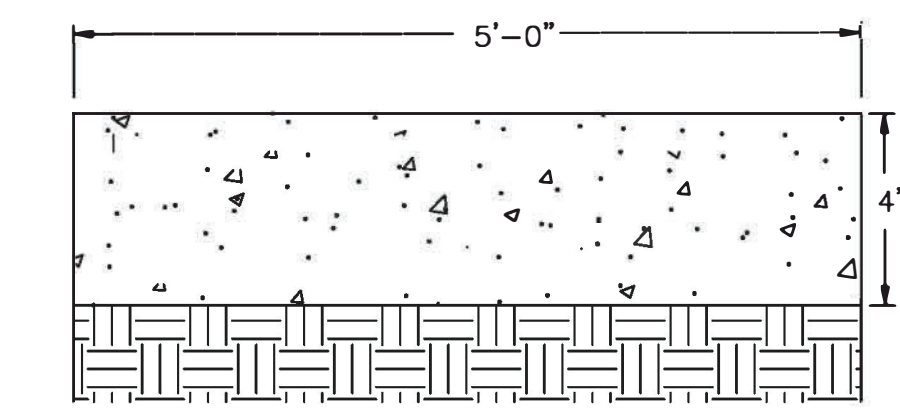


18" EXPULSION CURB SECTION NOT TO SCALE

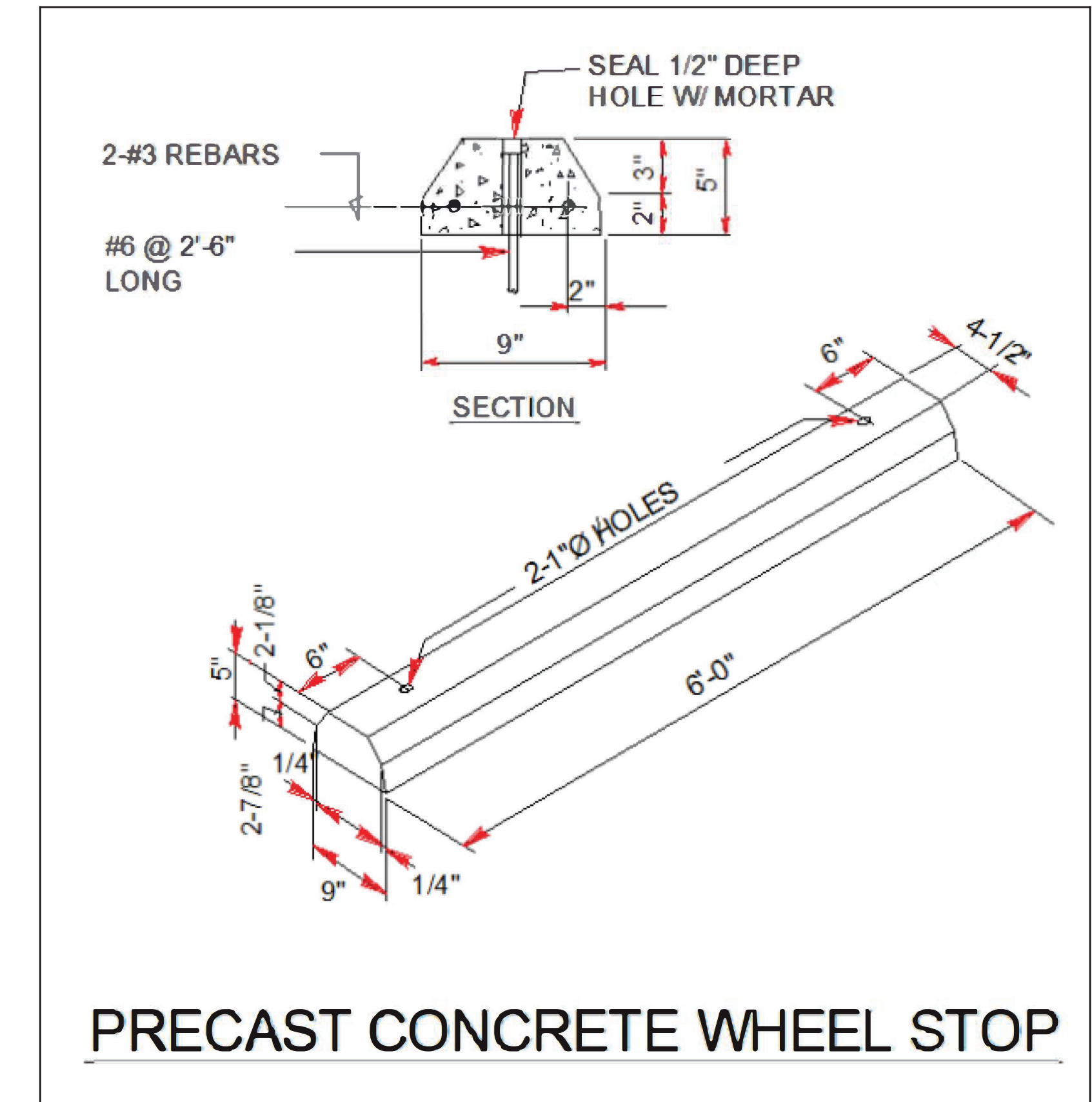


- NOTES:
1. CONCRETE CURB SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 4,000 PSI
 2. THE CONTRACTOR SHALL PROVIDE THE ENGINEERING DEPARTMENT WITH CYLINDER TESTING DATA (SC-T-41) FROM AN INDEPENDENT LAB (AASHTO CERTIFIED) AND INSPECTOR CERTIFIED BY SCDOT TO INSPECT AND TEST INDICATING COMPRESSIVE STRENGTH OF CONCRETE TESTED. A MIN. OF 3 TEST CYLINDERS EQUALLY SPACED SHALL BE TAKEN FOR THE FIRST 1000 LINEAR FEET. AN ADDITIONAL CYLINDER SHALL BE TAKEN FOR EACH ADDITIONAL HUNDRED LINEAR FEET OF CURBING. ALL TESTS SHALL BE IDENTIFIED WITH STATION IDENTIFICATION NUMBERS. NO TEST CYLINDER SHALL ATTAIN LESS THAN 3000 PSI.

CONCRETE SIDEWALK NOT TO SCALE



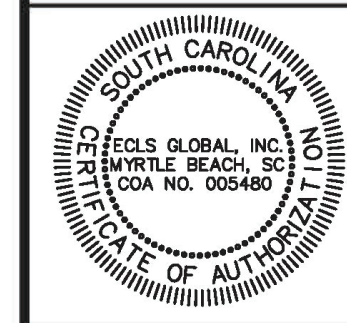
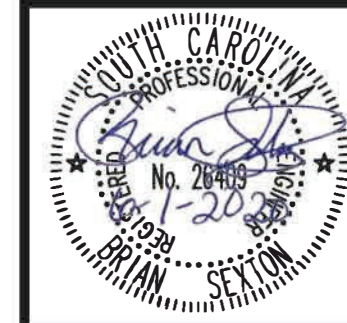
1. PLACE TRANSVERSE EXPANSION JOINTS (FULL DEPTH ACROSS THE ENTIRE SIDEWALK WIDTH) WHEN NEAR TURNS IN THE SIDEWALK, AND IN LONG CONTINUOUS RUNS OF SIDEWALK AS DIRECTED IN THE STANDARD SPECIFICATIONS.
2. PLACE EXPANSION JOINTS BETWEEN THE SIDEWALK EDGE AND THE BACK OF CURB WHEN ALONG A RADIUS LESS THAN 100'
3. PLACE EXPANSION JOINTS BETWEEN THE SIDEWALK EDGE AND ANY ADJACENT STRUCTURE (RETAINING WALLS, BUILDINGS, ETC.)
4. PLACE CONTRACTION JOINTS AT REGULAR INTERVALS BETWEEN EXPANSION JOINTS NOT TO EXCEED STANDARD SPECIFICATION SPACING.
5. MEASURE SIDEWALK IN SQUARE YARDS BY THE ACTUAL PLACED AREA OF CONCRETE UP TO THE ADJACENT PAY ITEM LIMITS (CURBS, PEDESTRIAN RAMPS, DRIVEWAYS, ETC.).
6. CONCRETE SHALL BE 4,000 PSI



PRECAST CONCRETE WHEEL STOP

REVISIONS:

CHECKED BY: MBS



DETAILS 3

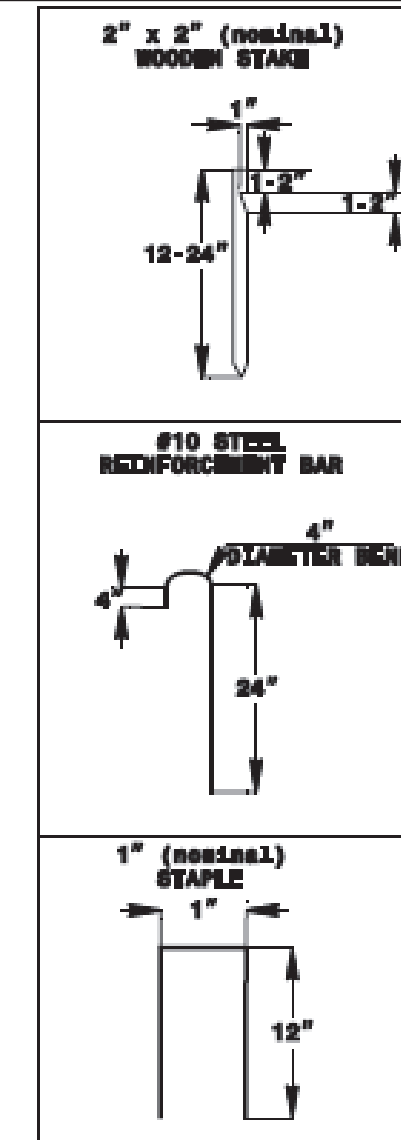
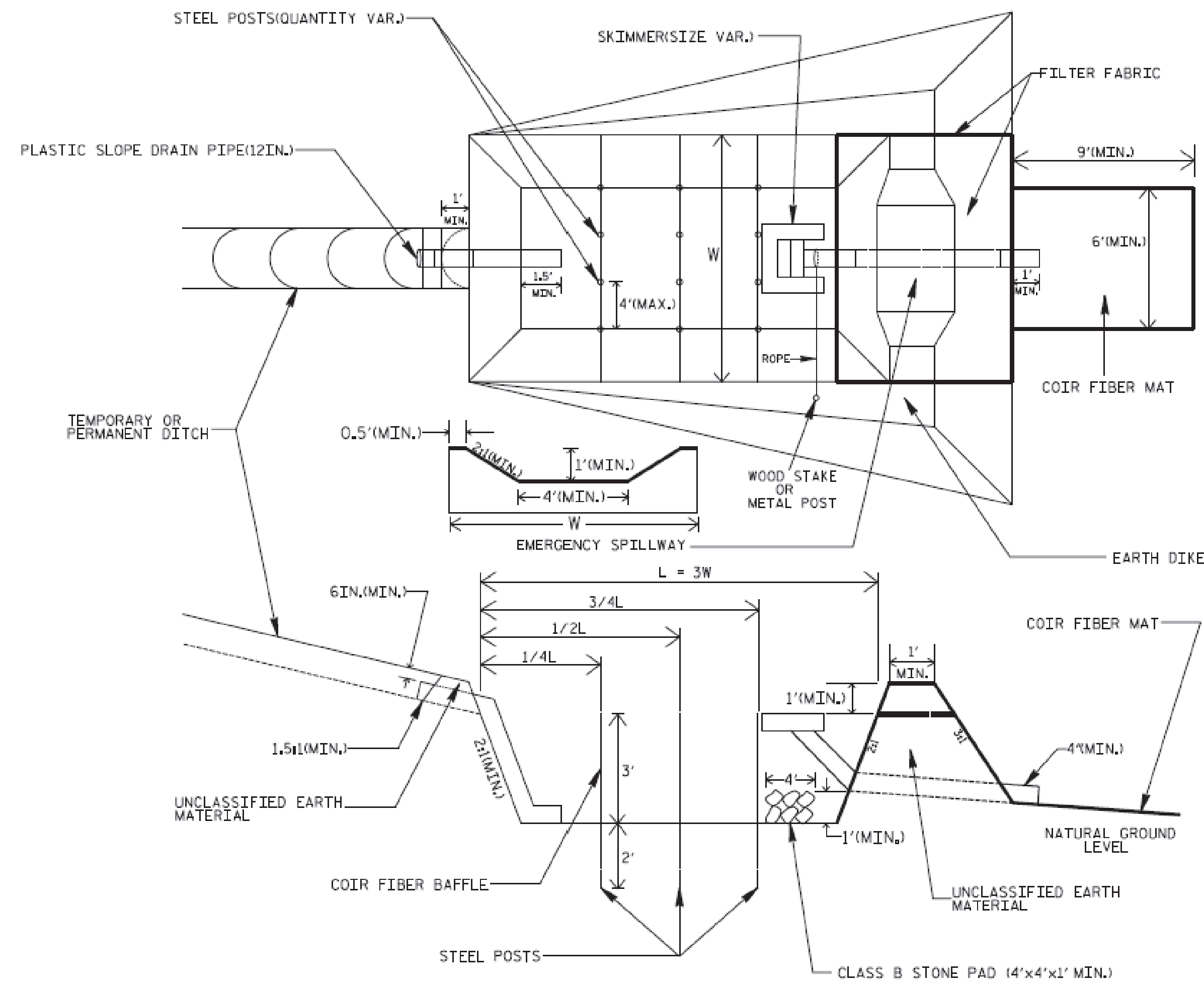
PROPANE BUS FUELING STATION & CDD TRAINING PAD
FOR
HORRY COUNTY SCHOOLS
HORRY COUNTY SOUTH CAROLINA

PROJ. NO.: SC20-101
DESIGNED BY: MBS/PTP
DRAWN BY: PTP
SCALE: NTS
DATE: 08-03-2020

ECLS

Drawing name: Z:\2020 Projects\SC20-101 HCS Records Center Survey Backup\Design\Design CAD Drawings\Construction Sheets\C11-DETAILS 5.dwg DETAILS 2 Jun 02, 2020 4:54pm by: bjsby

SKIMMER BASIN WITH BAFFLES DETAIL



COIR FIBER MAT ANCHOR OPTIONS

MAINTENANCE REQUIREMENTS

1. INSPECT SKIMMER BASINS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5 INCH OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO MORE ONE-HALF THE HEIGHT OF THE FIRST BAFFLE. PULL THE SKIMMER TO ONE SIDE SO THAT SEDIMENT UNDERNEATH IT CAN BE EXCAVATED. EXCAVATE THE SEDIMENT FROM THE ENTIRE BASIN NOT JUST AROUND THE SKIMMER OR THE FIRST CELL. MAKE SURE VEGETATION GROWING IN THE BOTTOM OF THE BASIN DOES NOT HOLD DOWN THE SKIMMER.
2. REPAIR THE BAFFLES IF THEY ARE DAMAGED. RE-ANCHOR THE BAFFLES IF WATER IS FLOWING UNDERNEATH OR AROUND THEM.
3. CHECK TO SEE IF THE SKIMMER IS CLOGGED WITH TRASH OR DEBRIS. KEEP THE SKIMMER ORIFICE FREE OF TRASH AND DEBRIS.
4. CHECK THE FABRIC LINED SPILLWAY FOR DAMAGE AND MAKE ANY NECESSARY REPAIRS WITH FABRIC THAT SPANS THE FULL WIDTH OF THE SPILLWAY.
5. CHECK THE EMBANKMENT, SPILLWAYS AND OUTLETS FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY.
6. REMOVE ALL TRASH AND DEBRIS FROM THE SKIMMER AND POOL AREAS.

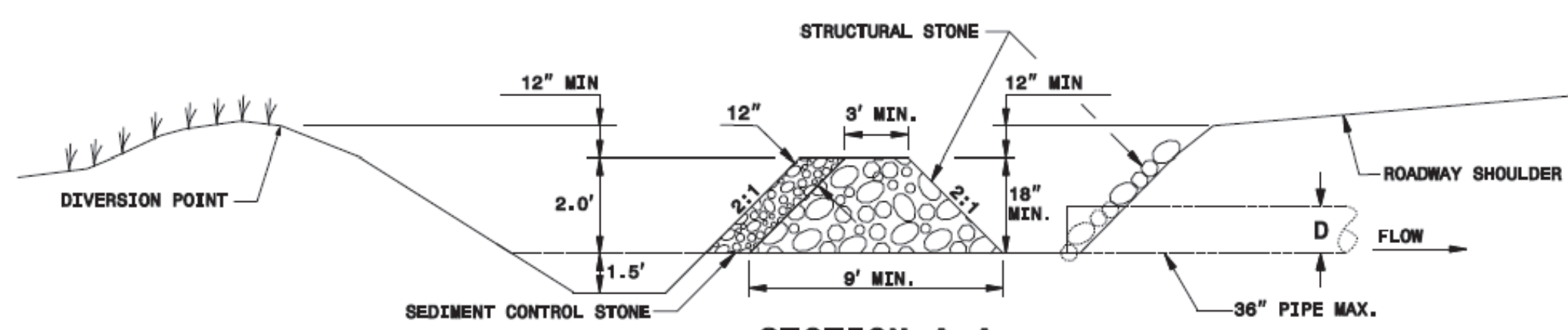
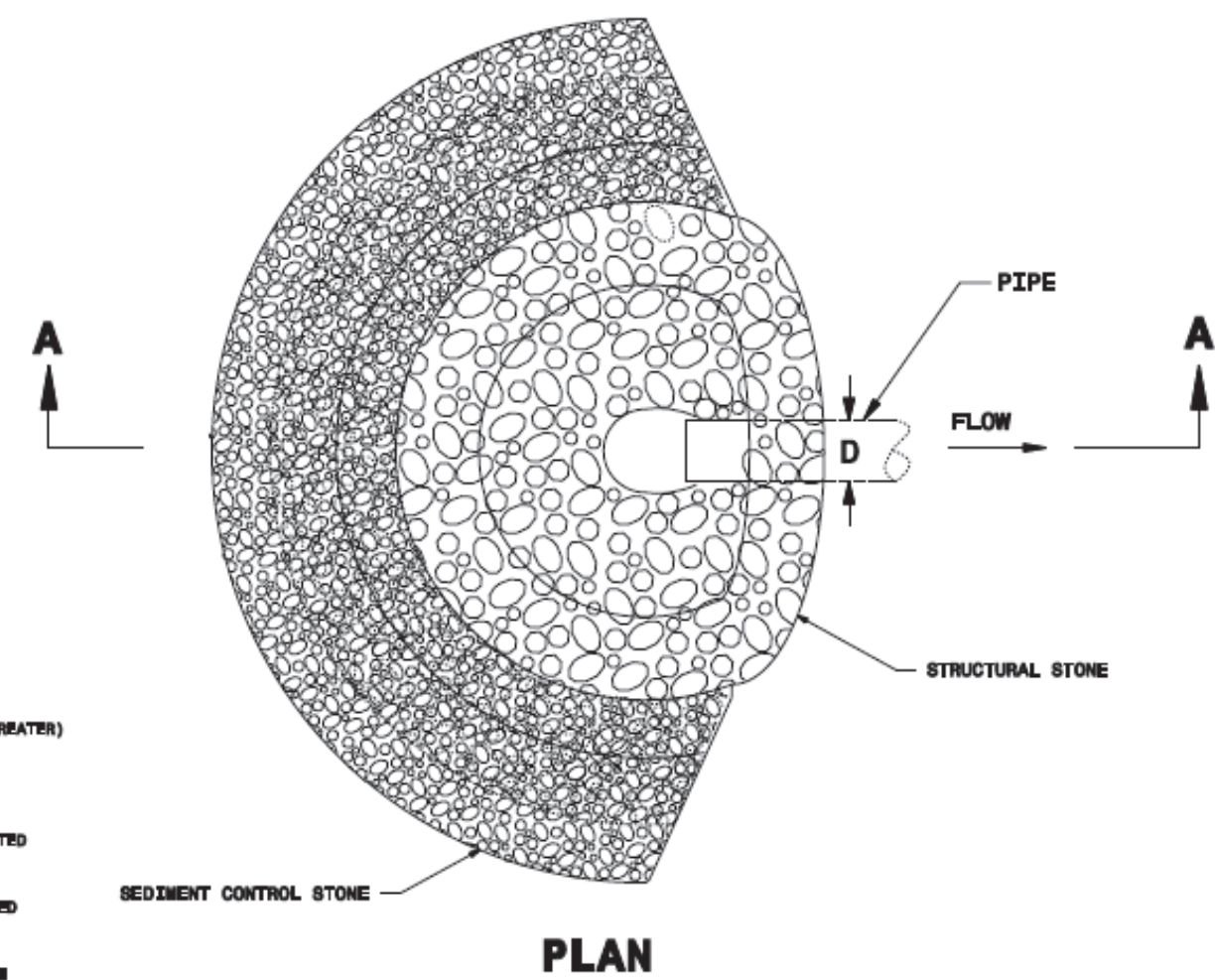
- NOTES**
1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR SIDESLOPES.
 2. LIMIT EARTH DIKE HEIGHT TO 5 FT.
 3. THE MINIMUM BASIN WIDTH SHALL BE 9 FT.
 4. DETERMINE EMERGENCY SPILLWAY LENGTH (FT.) USING $Q/0.8$, WHERE Q IS FLOW RATE (CFS) INTO BASIN.

NOT TO SCALE

NOTE:
 USE CLASS 'B' EROSION CONTROL STONE FOR STRUCTURAL STONE.
 USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL STONE.
 CONSTRUCT TOP OF BERM A MINIMUM OF ONE FOOT BELOW THE SHOULDER OR DIVERSION POINT.
 PROVIDE A TOTAL SEDIMENT TRAP VOLUME OF 3600 CUBIC FEET PER ACRE OF DISTURBED AREA. SOME OF THE REQUIRED VOLUME MAY BE PROVIDED BY UP OR DOWNSTREAM CONTROLS.

MAINTENANCE REQUIREMENTS

- IMPROVE ROCK PIPE INLET PROTECTION AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5 INCH OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. REMOVE SEDIMENT AND RESTORE THE SEDIMENT STORAGE AREA TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE TRAP.
- PLACE THE SEDIMENT THAT IS REMOVED IN THE DESIGNATED DISPOSAL AREA AND REPLACE THE CONTAMINATED PART OF THE GRAVEL FACED.
- CHECK THE STRUCTURE FOR DAMAGE. ANY REPAIR REPLACED FROM THE STONE HORIZONTALS MUST BE REPLACED IMMEDIATELY.
- AFTER ALL THE SEDIMENT-PRODUCING AREAS HAVE BEEN PERMANENTLY STABILIZED, REMOVE THE STRUCTURE AND ALL THE UNDESIRABLE SEDIMENT. SMOOTH THE AREA TO BLEND WITH THE ADJACENT AREAS AND PROVIDE PERMANENT GROUND COVER.



PIPE INLET PROTECTION



REVISIONS:

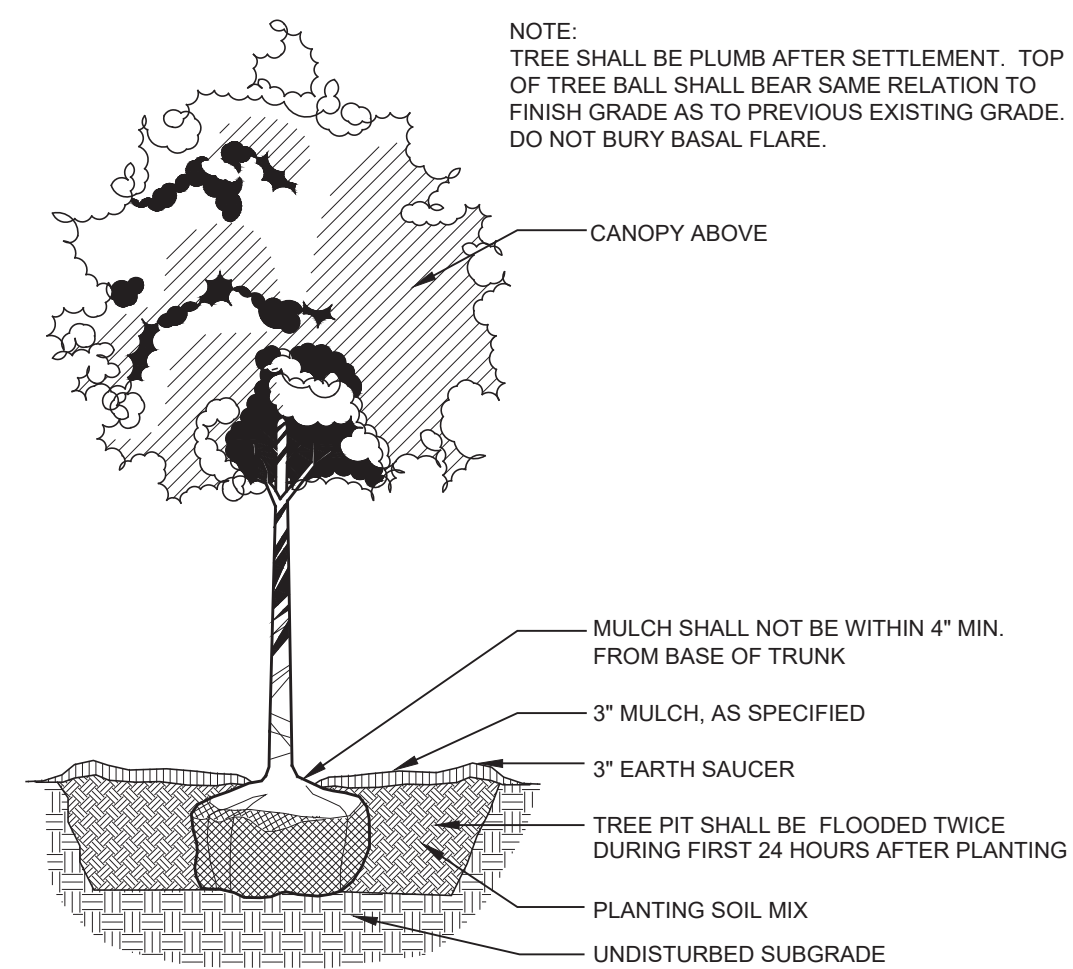
CHECKED BY: MBS



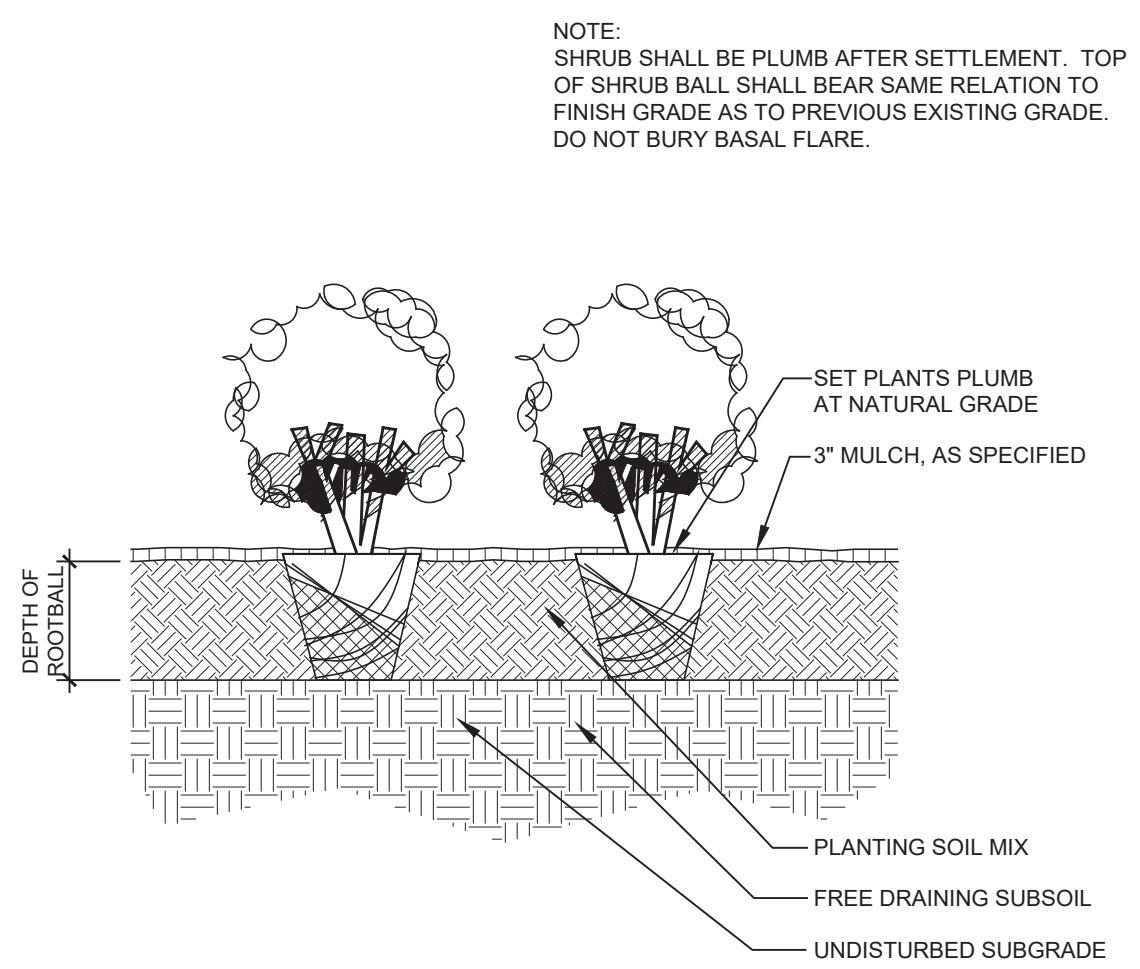
DETAILS 5

PROPANE BUS FUELING STATION & CDI TRAINING PAD FOR Horry County Schools Horry County South Carolina

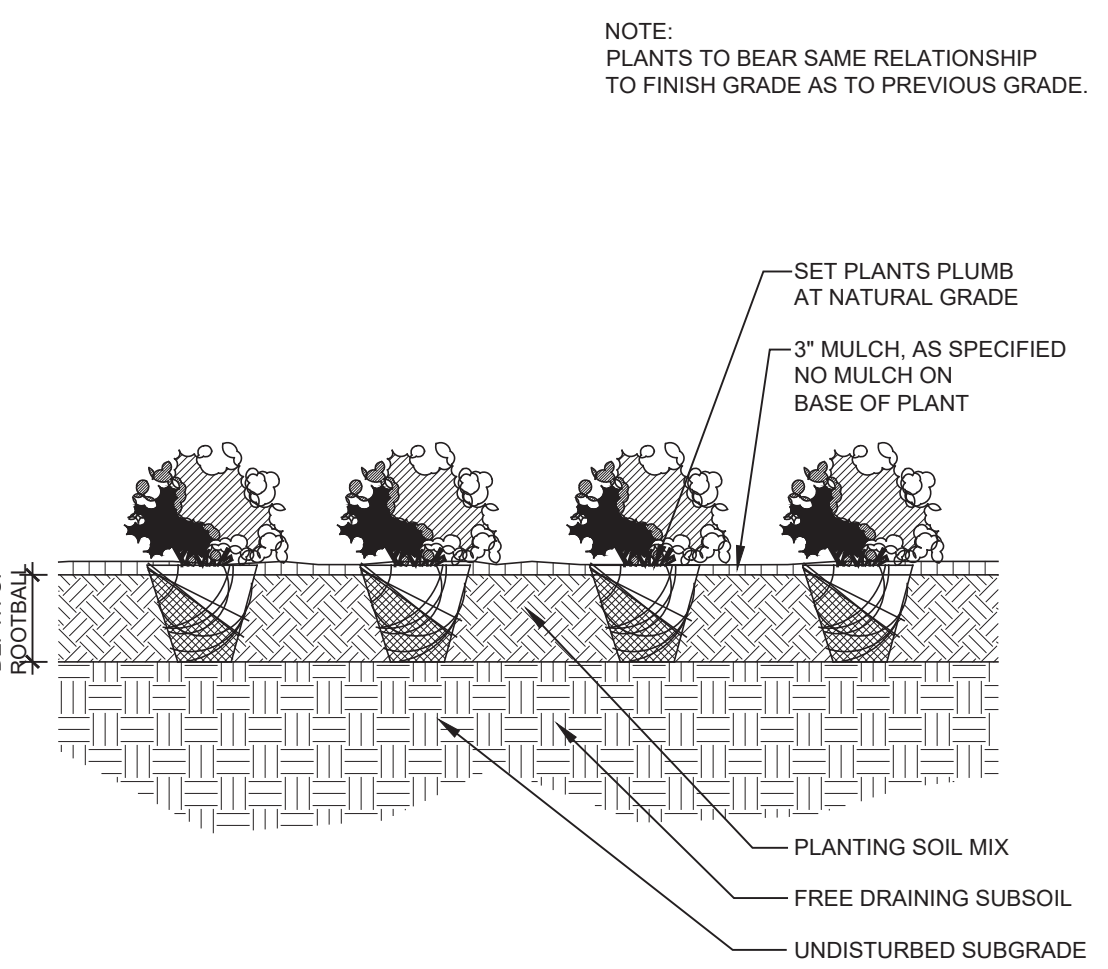
PROJ. NO.: SC20-101
 DESIGNED BY: MBS/PTP
 DRAWN BY: ptp
 SCALE: NTS
 DATE: 06-03-2020



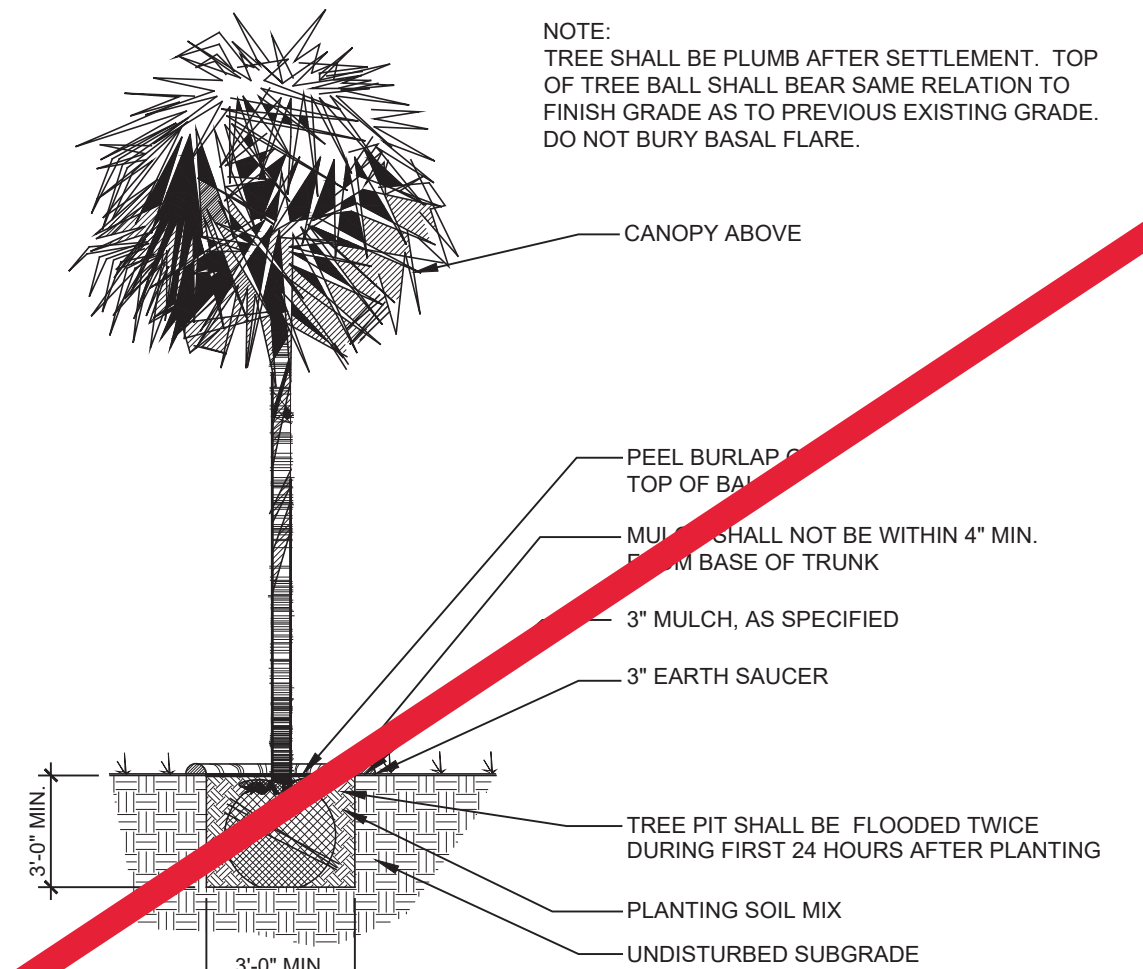
A TREE PLANTING DETAIL
SCALE: 1" = 1'-0"
LSP_001



B SHRUB PLANTING DETAIL
SCALE: 1" = 1'-0"
LSP_002



C GROUNDCOVER DETAIL
SCALE: 1" = 1'-0"
LSP_003



D PALMETTO PLANTING DETAIL
SCALE: 1" = 1'-0"
LSP_004

THE SHEET HAS BEEN REMOVED FROM THE BID PLANS PER ADDENDUM #1.

PER ADDENDUM # 1 - ALL LANDSCAPING WILL BE COVERED UNDER THE NEW LANDSCAPING ALLOWANCE

CONWAY, LANDSCAPING

CANOPY TREE	UNDERSTORY TREE	TALL SHRUB
285/100	n/a	285/100
2.85'2-6	n/a	2.85'15-43
20/8	n/a	282/100
2.5'1-3	n/a	2.82'25-71
n/a	586/100	586/100
n/a	5.86'2-12	5.86'18-106
n/a	586/100	586/100
n/a	5.86'2-12	5.86'18-106
TOTAL REQUIRED:	24	326
TOTAL PROVIDED:	26	343

PLANT LIST:

QUANTITY	SYMBOL	COMMON NAME	BOTANICAL NAME	TYPE	MIN. SIZE	MIN. CONTAINER
TREES:						
0	CR	CRAPE MYRTLE - NATCHEZ	LAGERSTROEMIA INDICA FAURIEI NATCHEZ (WHITE)	EVERGREEN	8-9 FEET HEIGHT, MULTI TRUNK	30 GAL
0	CW	CRAPE MYRTLE - BILOXI	LAGERSTROEMIA INDICA BILOXI (WHITE)	EVERGREEN	8-9 FEET HEIGHT, MULTI TRUNK	30 GAL
0	CP	CRAPE MYRTLE - PURPLE TOWER	LAGERSTROEMIA INDICA PURPLE TOWER (PURPLE)	EVERGREEN	8-9 FEET HEIGHT, MULTI TRUNK	30 GAL
6	SO	SOUTHERN LIVE OAK	QUERCUS VIRGINIANA	EVERGREEN	12-14 FEET HEIGHT, 3" TRUNK	3 GAL
0	SC	SCARLET OAK	QUERCUS COCCINEA	EVERGREEN	12-14 FEET HEIGHT, 3" TRUNK	3 GAL
21	CE	CHINESE ELM	ULMUS PARVIFOLIA	EVERGREEN	12-14 FEET HEIGHT, 3" TRUNK	3 GAL
8	RB	RIVER BIRCH	BETULA NIGRA	EVERGREEN	8-9 FEET HEIGHT, MULTI TRUNK	3 GAL
0	RM	RED MAPLE	ACER RUBRUM	EVERGREEN	12-14 FEET HEIGHT, 3" TRUNK	3 GAL
0	TP	TULIP POPLAR	LIRIODENDRON TULIPIFERA	EVERGREEN	7-8 FEET HEIGHT	3 GAL
0	LC	LEYLAND CYPRESS	CUPRESSOCYPRUS LEYLANDI	EVERGREEN	7-8 FEET HEIGHT	3 GAL
0	WL	WEeping WILLOW	SALIX BABYLONICA	EVERGREEN	7-8 FEET HEIGHT	3 GAL
0	RH	ROBIN HOLLY	ILEX ROBIN COMIN	EVERGREEN	6-7 FEET HEIGHT	3 GAL
0	OH	OAKLEAF HOLLY	ILEX CORNIF PP#9487	EVERGREEN	4-5 FEET HEIGHT	3 GAL
0	SP	SABAL PALM, SLICK TRUNK	SABAL MAJOR	EVERGREEN	VARY HEIGHTS, 12-16 FT, 8-9 FT	3 GAL
SHRUBS:						
0	SB	SILVERBERRY	ELAEGNUS	EVERGREEN	3' HEIGHT	3 GAL
0	EP	EVERGREEN PITTOSPORUM	PITTOSPORUM TOBIRA	EVERGREEN	24" X 20" (W X H)	7 GAL
0	YH	DWARF YAUJON HOLLY	ILEX VOMITORIA NANA	EVERGREEN	18" X 18" (W X H)	3 GAL
0	IH	INDIAN HAWTHORNE	RAPIHOLEPIS INDICA	EVERGREEN	18" X 18" (W X H)	3 GAL
0	PJ	PARSON JUNIPER	JUNIPERUS SQUAMATA EXPANSA 'PARSON'	EVERGREEN	18" X 18" (W X H)	3 GAL
0	LP	LOROPETALUM	LOROPETALUM CHINENSIS	EVERGREEN	3' HEIGHT	3 GAL
0	RY	ROSEMARY	ROSMARINUS OFFICINALIS	EVERGREEN	3' HEIGHT	3 GAL
43	VB	DOUBLEDLE VIBURNUM	VIBURNUM PLICATUM TOMENTOSUM MARIESII	EVERGREEN	2'-3" HEIGHT	3 GAL
300	YH	BORDEAUX YAUJON HOLLY	ILEX VOMITORIA BORDEAUX	EVERGREEN	3' HEIGHT	3 GAL
0	JM	JAPANESE MOCK ORANGE	PITTOSPORUM TOBIRA	EVERGREEN	3' HEIGHT	3 GAL
0	VM	VARIEGATED MOCK ORANGE	VARIEGATED PITTOSPORUM	EVERGREEN	3' HEIGHT	3 GAL
0	MH	MEXICAN HEATHER	CUPHEA HYSSOPIFOLIA	EVERGREEN	3' HEIGHT	3 GAL
0	VS	VIBURNUM SUSPENSUM	VIBURNUM SUSPENSUM	EVERGREEN	3' HEIGHT	1 GAL
0	WX	WAX MYRTLE	MYRTICA CERIFERA	EVERGREEN	3' HEIGHT	2 GAL
0	SW	SAW PALMETTO	SERENDA REPENS	EVERGREEN	3' HEIGHT	3 GAL
0	MP	MEDITERRANEAN FAN PALM	CHAMAEEROPUS HUMILIS	EVERGREEN	3' HEIGHT	3 GAL
G.COVER:						
0	SG	SWEET GRASS	HIEROCHLOE ODORATA	EVERGREEN	12" X 12" (W X H)	3 PACK
0	AG	ADAGIO GRASS	MISCANTHUS SINENSIS	EVERGREEN	12" X 12" (W X H)	3 GAL
0	BG	BREEZE GRASS	LOMANDRA LONGIFOLIA	EVERGREEN	12" X 12" (W X H)	3 GAL
0	MG	DWARF MAIDEN GRASS	PENNISETUM ALOPECUROIDES HAMELII	EVERGREEN	3" X 3" (W X H)	1 GAL
0	LA	NEW GOLD LANTANA	LANTANA CAMARA NEW GOLD	EVERGREEN	8"X8"	1 GAL
0	DA	DAYLILY	HEMEROCALLIS LILGASPHODELLUS	EVERGREEN	1 EVERY 6 INCHES	1 GAL
0	NA	MIXED ANNUALS				
NOTES:						
1. CENTIPEDE SOD ALL AREAS. NO TURF REINFORCEMENT NETTING ALLOW ON SOD.						
2. DARK CHOCOLATE WOOD CHIP MULCH ALL PLANT BED AREAS.						
3. MULCH AREAS TO BE 3'-0" AROUND ALL SHRUBS AND TREES.						
4. THE CONTRACTOR SHALL ARRANGE AN ON-SITE MEETING WITH THE LANDSCAPE ARCHITECT TO APPROVE THE PLANT MATERIALS IN THEIR ORIGINAL CONTAINERS AND TO INSPECT PLANT BED PREPARATION PRIOR TO INSTALLATION OF PLANT MATERIALS.						

D3G ARCHITECTS, LLC
WWW.D3GA.NET
843.427.4450
350 HILTON ROAD / SUITE 101
MYRTLE BEACH, SC 29572

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SOUTH CAROLINA REGISTERED ARCHITECT
DAVID C. DEITZ
LICENSE NO. 6624
06/03/20

PROJECT TITLE:
Conway High School Bus Fueling Station

Horry County Schools
1600 9th Avenue
Conway, SC

FILE NUMBER: 2016

SHEET TITLE: LANDSCAPE SCHEDULE
LANDSCAPE DETAILS

DATE: June 2, 2020
REVISION DATE:

SHEET NUMBER:
L1.01

SHRUB LEGEND:

⊗ SILVERBERRY	⊗ DOUBLEFILE VIBURNUM
⊗ PITTOSPORUM	⊗ BORDEAUX YAUPON HOLLY
⊗ DWARF YAUPON HOLLY	⊗ JAPANESE MOCK ORANGE
⊗ INDIAN HAWTHORN	⊗ VARIEGATED MOCK ORANGE
⊗ PARSON JUNIPER	⊗ MEXICAN HEATHER
⊗ LOROPETALUM	⊗ WAX MYRTLE
⊗ ROSEMARY	⊗ VIBURNUM SUSPENSUM
⊗ SAW PALMETTO	⊗ MEDITERRANEAN FAN PALM

GROUNDCOVER LEGEND:

○ SWEET GRASS	○ BREEZE GRASS
○ ADAGIO GRASS	○ DWARF MAIDEN GRASS
○ LANTANA	○ DAYLILY

TREE LEGEND:

⊗ CRAPE MYRTLE NATEZ	⊗ RED MAPLE	⊗ SOUTHERN LIVE OAK	⊗ WEEPING WILLOW
⊗ CRAPE MYRTLE BILOXI	⊗ TULIP POPLAR	⊗ SCARLET OAK	⊗ ROBIN HOLLY
⊗ CRAPE MYRTLE PURPLE TOWER	⊗ LEYLAND CYPRESS	⊗ CHINESE ELM	⊗ OAKLEAF HOLLY
		⊗ RIVER BIRCH	⊗ SABAL PALM



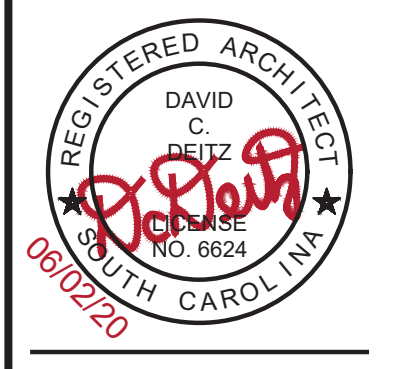
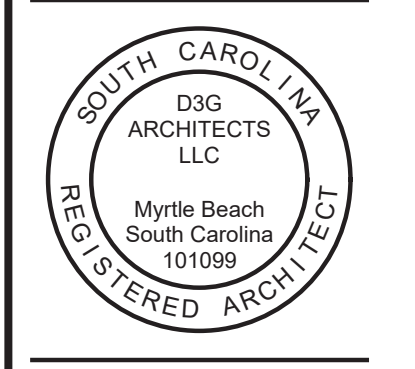
THE SHEET HAS BEEN REMOVED FROM THE BID PLANS PER ADDENDUM #1. PER ADDENDUM # 1 - ALL LANDSCAPING WILL BE COVERED UNDER THE NEW LANDSCAPING ALLOWANCE

1 LANDSCAPE PLAN
SCALE: 1" = 20'-0"



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PROJECT TITLE:
Conway High School Bus Fueling Station

Horry County Schools
1600 9th Avenue
Conway, SC

FILE NUMBER: 2016
SHEET TITLE: LANDSCAPE PLAN

DATE: June 2, 2020
REVISION DATE:

SHEET NUMBER:
L1.02



Vicinity Map - Not to Scale

Legend

- IRF - iron rebar found
- IPF - iron pipe found
- IRS - iron rebar set
- PKNF - pk nail found
- CMF - concrete monument found
- EOP - edge of pavement
- BOC - back of curb
- △ - map / computed point
- ⊙ - sewer manhole
- ⊙ - power pole
- ⊙ - telephone pedestal
- ⊙ - underground telephone
- ⊙ - guy wire
- ⊙ - drop inlet

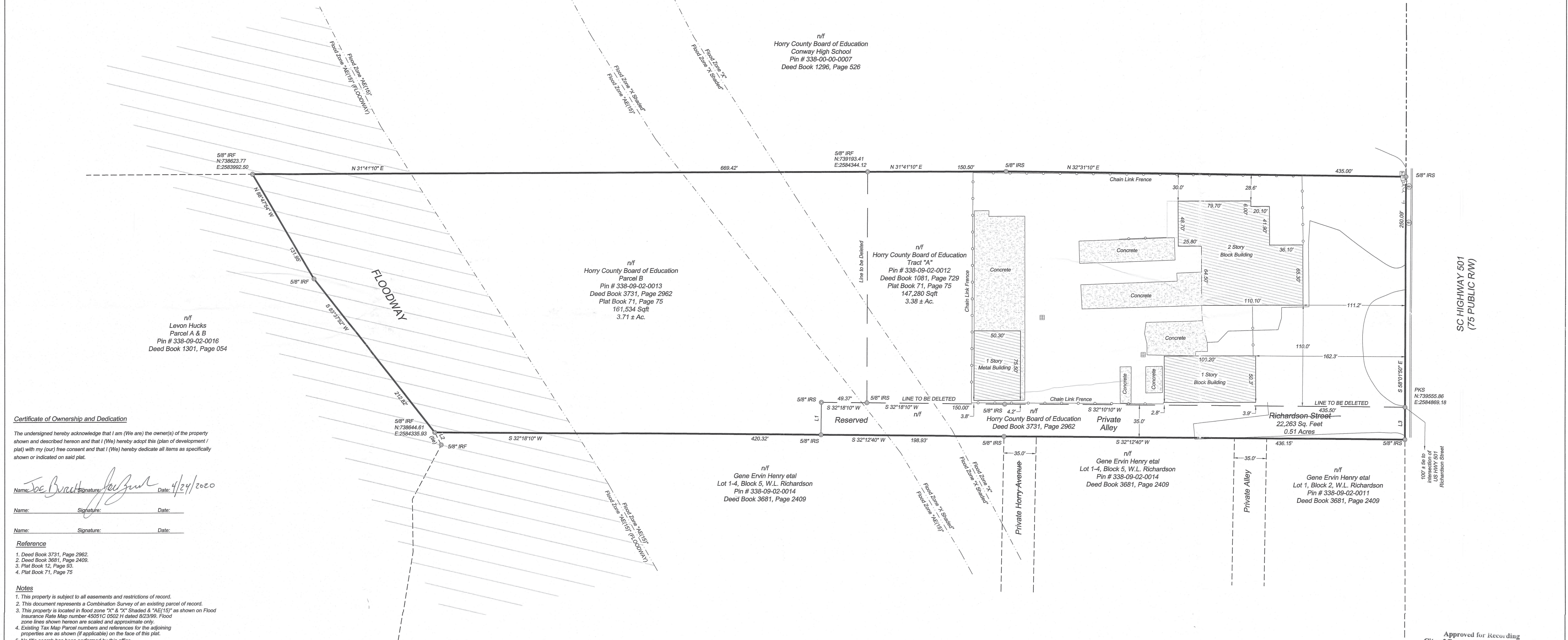
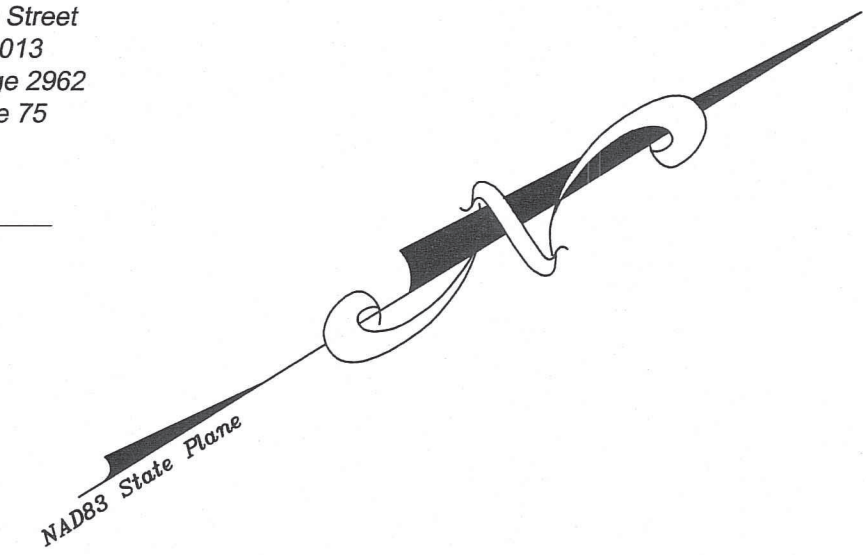
Line Work Legend

- adjoining RW property lines
- parent tract property line
- adjoining property lines
- overhead power line

LINE	BEARING	DISTANCE
L1	S 57°41'50" E	135.22'
L2	S 86°00'54" E	115.19'
L3	S 58°01'50" E	35.22'

n/f	n/f	n/f
Horry County Board of Education Tract "A" Pin # 338-09-02-0012 Deed Book 1081, Page 729 Plat Book 71, Page 75 147,280 Sqft 3.38 ± Ac.	Horry County Board of Education Parcel B Pin # 338-09-02-0013 Deed Book 3731, Page 2962 Plat Book 71, Page 75 161,534 Sqft 3.71 ± Ac.	Horry County Board of Education 35' Road Richardson Street Pin # 338-09-02-0013 Deed Book 3731, Page 2962 Plat Book 71, Page 75 22,263 Sqft 0.51 ± Ac.

Total Combined Area
331,078 Sqft
7.60 ± Ac.



Certificate of Ownership and Dedication

The undersigned hereby acknowledge that I am (We are) the owner(s) of the property shown and described hereon and that I (We) hereby adopt this (plan of development / plat) with my (our) free consent and that I (We) hereby dedicate all items as specifically shown or indicated on said plat.

Name: Joe Bracht Signature: [Signature] Date: 4/24/2020

Name: _____ Signature: _____ Date: _____

- Reference**
1. Deed Book 3731, Page 2962.
 2. Deed Book 3681, Page 2409.
 3. Plat Book 12, Page 83.
 4. Plat Book 71, Page 75

- Notes**
1. This property is subject to all assessments and restrictions of record.
 2. This document represents a Combination Survey of an existing parcel of record.
 3. This property is located in flood zone "X" & "X" Shaded & "AE(15)" as shown on Flood Insurance Rate Map number 45051C 0502 H dated 8/23/99. Flood zone lines shown hereon are scaled and approximate only.
 4. Existing Tax Map Parcel numbers and references for the adjoining properties are as shown (if applicable) on the face of this plat.
 5. No title search has been performed by this office.
 6. Parent Pin Map No. 338-09-02-0012 & 0013
 7. This survey is valid only if a print of the same has the original signature and embossed seal of the surveyor.
 8. No subsurface or environmental conditions have been considered as part of this survey and no statement has been made concerning the locations of underground utilities or facilities that may affect the use or development of this property.
 9. Bearings based on South Carolina NAD83 State Plane Coordinate System. All distances are horizontal ground distance, not grid distances.

Plat BK: 292 PG: 192 Doctype: 061
04/30/2020 at 02:03:46 PM, 1 OF 1
Marion D. Foxworth III
Horry County, SC Registrar of Deeds

Approved for Recording
City of Conway Planning Department
By: [Signature]
Date: 4/24/20

CRESCENT MOON
LAND SURVEYING
643 Hwy 701 S.
Loris, S.C. 29569
Phone: (843) 716-6021

DRAWN BY: KLM	JOB# 2019-360	REVISIONS:
CLOSURE CHECKED BY: RRE	DATE OF SURVEY: 06/24/2019	08/15/2019 Combined Richardson Street
APPROVED BY: RRE		04/23/2020 County Revisions

Combination Survey
of
Pin# 338-09-02-0012 & 0013
Containing 7.60 ± Acres Total
City of Conway, Horry County, South Carolina
for
Horry County Board of Education

GRAPHIC SCALE
50 0 25 50 100 150 200
(IN FEET)
1 inch = 50 ft.

Certificate of Accuracy
I hereby state that to the best of my professional knowledge, information, and belief, the survey shown herein was made in accordance with the requirements of the Standards of Practice Manual for Surveying in South Carolina, and meets or exceeds the requirements for a Class A survey as specified therein; also there are no visible encroachments or projections other than shown.

PLS# 22753
4/23/20
DATE