



**Procurement Office
Kaye B. Syfrett
Purchasing Manager
31 Klein Street, Room 208
Walterboro, SC 29488
Phone: (843) 782-0504**

**CC-11 New Road Construction
Bids will be accepted until
11:00am, Tuesday, December 31, 2013**

Addendum #1

This addendum is dated December 13, 2013

- Limits of Demolition
 - Only demolition is at the beginning of the roadway extension in order to provide a smooth transition between existing and proposed roadways.
- Select Pipe Backfill
 - Contractor to reference Technical Specifications (attached) for pipe backfill guidelines.
- Underground Utilities
 - Within the project area underground utilities are located at approximate Station 15+50 and include sanitary sewer force main and gravity sewer. These have been abandoned and are no longer in service as the existing facility has connected to the local municipality sewer system. Approximate depths of the utilities are illustrated on roadway profile sheets as well.
- Liquidated Damages
 - Liquidated Damages will become effective 120 days after County issues Notice to Proceed to the selected Contractor. Contractor must continue to provide a proposed construction schedule with their bid. Additional verbiage will be included within the General Conditions to address how liquidated damages will be handled specifically for this project.
- Material Testing Quality Control

- This will be handled by the County through the Engineers - Thomas & Hutton. A geotechnical firm has not been selected at this time.
- Bid, Performance & Payment Bonds
 - Bid bond is 5% of the contractors bid and accompanies the bid. Performance and Payment bonds will be required in for the project per the project bid & contract documents.
- Soils Report
 - A soils report (attached) will be issued as part of this addendum. This project is referenced in the soils report as “Wire Facility”.

BID FORM VENTURE PARK ROADWAY FOR COLLETON COUNTY, SOUTH CAROLINA						
CC-11 NEW ROAD CONSTRUCTION						
ITEM NO.	SCDOT BID ITEM NO.	DESCRIPTION	EST. QTY	UNIT	UNIT COST	TOTAL AMOUNT
1	1031000	Mobilization	1.00	LS		\$ -
2	1050800	Construction Stakes, Lines, & Grades	1.00	LS		\$ -
3	1071000	Traffic Control	1.00	LS		\$ -
4	2011001	Clearing & Grubbing	3.32	AC		\$ -
5	2025000	REM.&DISP.OF EXIST ASPH. PVMT.	285.00	SY		\$ -
6	2031000	Unclassified Excavation	3,450.00	CY		\$ -
7	3050108	Graded Agg. Base Course (8" Unif.)	5,892.00	SY		\$ -
8	4010005	Prime Coat	1,768.00	GAL		\$ -
9	4011004	Liquid Asphalt Binder PG64-22	68.00	TON		\$ -
10	4011004	Liquid Asphalt Binder PG64-22 - Existing Venture Roadway Surface	33.00	TON		\$ -
11	4020320	Hot Mix Asphalt Intermediate Course Type B (2" Uniform)	650.00	TON		\$ -
12	4030320	Hot Mix Asphalt Surface Course - Type B (2" Uniform)	650.00	TON		\$ -
13	4030320	Hot Mix Asphalt Surface Course - Type B (2" Uniform) - Existing Venture Roadway Surface	620.00	TON		\$ -
14	609115B	Pavement Markings (Temporary Paint) - 4" Yellow Solid Lines	2,400.00	LF		\$ -
15	6241074	4" Yellow Solid Lines (Pvt. Edge Lines) - Perm. Pvm. Markings	2,400.00	LF		\$ -
16	609115B	Pavement Markings (Temporary Paint) - 4" Yellow Solid Lines - Existing Venture Roadway Surface	1,640.00	LF		\$ -
17	6241074	4" Yellow Solid Lines (Pvt. Edge Lines) - Perm. Pvm. Markings - Existing Venture Roadway Surface	1,640.00	LF		\$ -
18	6271025	24" White Solid Lines (Stop/Diagonal Lines) - Thermoplastic - 125 mil. - Existing Venture Roadway Surface	75.00	LF		\$ -
19	7141112	15" RC Pipe Cul. - Class III	52.00	LF		\$ -
20	7141113	18" RC Pipe Cul. - Class III	46.00	LF		\$ -
21	7141114	24" RC Pipe Cul. - Class III	78.00	LF		\$ -
22	7142512	15" R.C. BEV. END SECTN-CL3	1.00	EA		\$ -
23	7142513	18" R.C. BEV. END SECTN-CL3	2.00	EA		\$ -
24	7142514	24" R.C. BEV. END SECTN-CL3	2.00	EA		\$ -
25	7197120	Adjust Manhole	1.00	EA		\$ -
26	N/A	Rip Rap (Class B)	76.00	SY		\$ -
27	8048205	Geotextile for Erosion Control Under Rip Rap (Class 2) Type B	76.00	SY		\$ -
28	8100101	Permanent Cover	2.10	AC		\$ -
29	8100200	Temporary Cover	2.10	AC		\$ -
30	8152007	Sediment Tubes	26.00	LF		\$ -
31	8153000	Silt Fence	3,850.00	LF		\$ -
32	8153090	Repair/Replace Silt Fence	3,850.00	LF		\$ -
33	8154011	Temporary Porous Baffle	150.00	LF		\$ -
34	8154012	Temporary Floating Skimmer	1.00	EA		\$ -
35	8154050	Removal of Silt Retained By Silt Fence	3,850.00	LF		\$ -
36	8156490	Stabilized Construction Entrance	267.00	SY		\$ -
37	N/A	Riprap Filter Berm	1.00	EA		\$ -
38	N/A	Temporary Riser W/ Trash Rack	1.00	EA		\$ -
TOTAL OF BID					\$	-

Project Approach - Please attach an outline and schedule for completing this project.

 Company Name

 Address City, State, Zip Telephone number

 Authorized Signature Print Email Address

THIS PAGE MUST BE COMPLETED AND SUBMITTED AS PART OF YOUR BID

TECHNICAL SPECIFICATIONS

FOR

ROAD EXTENSION OF VENTURES PARK ROAD

PREPARED FOR

COLLETON COUNTY, SC

NOVEMBER 2013

J - 23928.0001

Prepared by:

THOMAS & HUTTON

Savannah, GA | Charleston, SC | Columbia, SC | Myrtle Beach, SC | Brunswick, GA |
Wilmington, NC

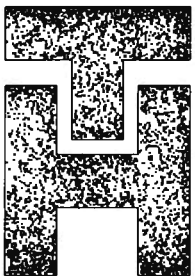


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SECTION 02110 – SITE CLEARING

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SECTION 02110**SITE CLEARING****PART 1 – GENERAL****1.1 SECTION INCLUDES**

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

1.2 RELATED SECTIONS

- A. Section 02204 - Earthwork.

1.3 MEASUREMENT AND PAYMENT

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

1.4 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for environmental requirements, disposal of debris, and use of herbicides.
- B. Coordinate clearing Work with utility companies.

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Provide tree protection materials as detailed on the construction drawings.

PART 3 – EXECUTION**3.1 PREPARATION**

- A. Verify existing plant life designated to remain is tagged or identified.

3.2 PROTECTION

- A. All trees on site will be saved except those marked specifically by the Owner's representative for removal during construction. No trees, including those marked for removal on site or any other tree, may be removed prior to the

preconstruction conference. All trees not to be removed will be protected from injury to their roots and to their top to a distance three feet beyond the drip-line and no grading, trenching, pruning, or storage of materials may go in this area except as provided by an Owner's representative stakeout. Contractor will pay a penalty for any tree removed from the site that has not been marked specifically for removal. Contractor also will pay for any tree that dies due to damage during construction. This applies to all trees on site whether or not they are shown on the plans.

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

The fines are as follows:

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

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

3.3 CLEARING

- A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be burned or removed

completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1-1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an accepted treewound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the OWNER before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures protruding, encroaching upon, or otherwise obstructing the work.

3.4 REMOVAL

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

3.5 DISPOSAL

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

3.6 GRUBBING

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

END OF SECTION

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SECTION 02204 – EARTHWORK

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SECTION 02204**EARTHWORK****PART 1 – GENERAL****1.1 SECTION INCLUDES**

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

1.2 RELATED SECTIONS

- A. Section 02110 – Site Clearing
- B. Section 02720 – Storm Drainage

1.3 MEASUREMENT AND PAYMENT

- A. Grading to subgrades, construction of ditches, dressing of disturbed areas, removing and replacing topsoil, excavating, backfilling and compacting to required elevations, testing, staking, and construction supervision shall be included in the contract lump sum price for "Unclassified Excavation."
- B. Unsuitable Material – No direct payment shall be made for unsuitable material. Payment shall be included in the contract lump sum price for unclassified excavation.
- C. Borrow – No direct payment shall be made for borrowed material. Payment shall be included in the contract lump sum price for unclassified excavation.
- D. Earthwork - All earthwork associated with the installation of bulkheads, headwalls, wingwalls, weir structures, drainage filters, rip-rap, etc. shall not be measured for direct payment. Payment for the earthwork shall be included in the item to which it pertains.

- E. Dewatering - No direct payment shall be made for dewatering. Dewatering shall be included in the item to which it pertains.
- F. Proof Rolling – No direct payment shall be made for proof rolling. Proof rolling shall be included in the lump sum price for unclassified excavation.

1.4 REFERENCES (LATEST REVISION)

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

1.5 SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with all applicable Federal, State, and local standards.

1.7 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. The testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any of the tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all

tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:

1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or
 2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 MATERIALS

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

2.2 SOURCE QUALITY CONTROL

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

PART 3 – EXECUTION

3.1 TOPSOIL

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

3.2 EXCAVATION

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

3.3 GROUND SURFACE PREPARATION FOR FILL

- A. All vegetation, roots, brush, heavy sods, heavy growth of grass, decayed vegetable matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.
- B. Sloped ground surfaces steeper than 1 vertical to 4 horizontal, on which fill is to be placed shall be plowed, stepped, or benched, or broken up as directed, in such a manner where fill material will bond with the existing surface.
- C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.4 FILL

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

3.5 FINISHED GRADING

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

3.6 DISPOSAL OF WASTE MATERIAL

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

3.7 PROTECTION

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

3.8 DRAINAGE

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

3.9 FIELD QUALITY CONTROL

- A. Compaction testing shall be performed in accordance with ASTM D 6938. Where tests indicate the backfill does not meet specified requirements, the backfill shall be reworked or removed and replaced, and then retested at the Contractor's expense.
- B. Unpaved areas - at least 90% of maximum laboratory density within 2% optimum moisture content unless otherwise approved by the Engineer.
- C. Paved Areas and Under Structures - top 6 inch layer of subbase to at least 98% of maximum laboratory density within 2% optimum moisture content. Layers below top 6 inches shall be compacted to 95% of maximum laboratory density within 2% optimum moisture content.
- D. Rolling and compaction equipment and methods shall be subject to acceptance by the Engineer. Acceptance in no way relieves Contractor of the responsibility to perform in correct and timely means.
- E. Number of Tests - Under paved areas, no less than one density test per horizontal layer per 5,000 square feet of subbase shall be made. In unpaved areas, no less than one density test per horizontal layer per 10,000 square feet of fill area shall be made. Under curb and gutter, no less than one density test per every 300 linear feet.

3.10 PROOF ROLLING

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

END OF SECTION

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SECTION 02210**SOIL EROSION CONTROL****PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 DESCRIPTION OF WORK

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

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

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

1.3 PURPOSES

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

1.4 QUALITY ASSURANCE

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

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

1.5 SUBMITTALS

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

1.6 MEASUREMENT AND PAYMENT

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

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

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

2.2 HAY BALES

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

2.3 SILT FENCE

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

Fabric shall meet the following requirements:

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

2.4 CHEMICALS FOR DUST CONTROL

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

2.5 RIP-RAP

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

2.6 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.1 GENERAL

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

3.2 GRASSING

- A. Refer to Section 02902 - Grassing.

3.3 SEDIMENT BARRIERS

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

3. Backfill the trench with previously excavated soil and compact it. Backfill soil should conform to ground level on downhill side of barrier and should be built up to 4 inches above ground on uphill side of bales.
4. Inspect and repair or replace damaged bales promptly. Remove hay bales when uphill sloped areas have been permanently stabilized.

B. Rock Ditch Check

1. Excavate a 6 inch deep trench the width and length of proposed barrier. Install a non-woven geotextile fabric in the trench before placing rock for the ditch check.
2. The body of the ditch check shall be constructed of 12 inch rip-rap. The upstream face may be covered with 1-inch washed stone.
3. Ditch checks shall not exceed a height of 2 feet at centerline of the channel and have a minimum top flow length of 2 feet.
4. Rip-rap shall be placed over the channel banks to prevent water from flowing around ditch check. Rock must be installed by hand or mechanical placement (no dumping of rock) to achieve complete coverage of the ditch and ensure the center of the check is lower than the edges.
5. The maximum spacing between ditch checks shall be where the toe of the upstream check is at the same elevation as the top of the downstream check.
6. Contractor shall maintain ditch checks as required by State regulations.

3.4 SILT FENCE

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

3.5 DUST CONTROL

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

3.6 SEDIMENT BASIN

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

3.7 RIP-RAP

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

3.8 CONSTRUCTION EXIT

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

3.9 INLET PROTECTION

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

END OF SECTION

INDEX TO

SECTION 02231 - AGGREGATE BASE COURSE

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SECTION 02231**AGGREGATE BASE COURSE****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 02204 – Earthwork.
- B. Section 02512 – Asphaltic Concrete/Binder/Surface Courses.

1.3 MEASUREMENT AND PAYMENT

- A. Aggregate Base Course: Payment will be made at the contract unit price. Payment will include supplying all material, labor, and equipment, stockpiling, scarifying substrate surface, placing where required, and compacting.
- B. Prime Coat: Payment will be made at the contract unit price. Payment will include all costs connected with applying prime coat.

1.4 REFERENCES (LATEST REVISION)

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

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction

1.6 TESTING

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

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Aggregate shall consist of processed and blended crushed stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings, and other foreign material and shall be durable and sound. Coarse aggregate shall have a percentage of wear not to exceed 65% after 500 revolutions as determined by ASTM C 131. Aggregate shall meet applicable requirements of Section 305.2 in the South Carolina Department of Transportation Standard 2007 Specifications for Highway Construction. Material shall meet the following gradation and other requirements:

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

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

- B. Prime Coat: Shall be EA-P Special, Emulsified asphalt, conforming to Section 407 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.

PART 3 – EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

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

3.3 AGGREGATE PLACEMENT

- A. Aggregate shall be placed in accordance with South Carolina Department of 2007 Transportation Standard Specifications for Highway Construction Section 305 and in accordance with all terms included in these specifications.
- B. Level and contour surfaces to elevations and slopes indicated.
- C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.
- F. While at optimum moisture ($\pm 1-1/2\%$), compact base course with rollers capable of obtaining required density. Vibratory, flatwheel, and other rollers accepted by the Engineer may be used to obtain required compaction. Rolling shall continue until base is compacted to 98% of the maximum laboratory dry density as determined by ASTM D 1557. In-place density of the compacted base will be determined in accordance with ASTM D 6938.

3.4 PRIME COAT

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

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

3.5 TOLERANCES

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

3.6 FIELD QUALITY CONTROL

- A. Section 01400 - Quality Assurance: Field inspection.
- B. Density and moisture testing will be performed in accordance with ASTM D 1557 and ASTM D 6938.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- D. Frequency of Tests:
 - 1. Shall be in accordance with SCDOT standards.

END OF SECTION

**INDEX TO
SECTION 02275 - RIP-RAP**

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SECTION 02275**RIP-RAP****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Material placed as bank protection and erosion control.

1.2 RELATED SECTIONS

- A. Section 2210 – Site Clearing
- B. Section 2720 – Storm Drainage

1.3 ALLOWABLE TOLERANCES

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

1.4 MEASUREMENT AND PAYMENT

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

1.5 REFERENCES (LATEST REVISION)

- A. ASTM C 150 – Portland Cement.

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Stone Rip-Rap: Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight or weather. Stone shall be solid and non-friable and range in weight from a minimum of 25 pounds to a maximum of 150 pounds. At least 50 percent of the stone pieces shall weigh more than 60 pounds. The stone pieces shall have a minimum dimension of 12 inches. Documents indicating stone analysis, source and other pertinent data (i.e. - filter fabric) shall be submitted for review by the Engineer prior to delivery.
- B. Sand-Cement Bag Rip-Rap:
 - 1. Bags: Shall be of cotton, burlap, or fiber-reinforced paper capable of containing the sand-cement mixture without leakage during handling and placing. Bags previously used for any purpose shall not be used. Capacity shall be not less than 0.75 cubic foot nor more than two cubic feet.

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

2.2 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.1 PREPARATION

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

3.2 PLACEMENT

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

Larger stones shall be well distributed and the entire mass of stone shall conform to gradation specified. All material used in rip-rap protection shall be placed and

distributed so there will be no large accumulations of either the larger or smaller sizes of stone.

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

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

END OF SECTION

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SECTION 02512SC – ASPHALTIC CONCRETE BINDER/SURFACE COURSES

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SECTION 02512SC**ASPHALTIC CONCRETE BINDER/SURFACE COURSES****PART 1 – GENERAL****1.1 SECTION INCLUDES**

- A. Surface Course
- B. Binder Course

1.2 RELATED SECTIONS

- A. Section 02204 – Earthwork
- B. Section 02231 – Aggregate Base Course

1.3 MEASUREMENT AND PAYMENT

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

1.4 REFERENCES (LATEST REVISION)

- A. ASTM D 946 – Penetration-Graded Asphalt-Cement for Use in Pavement Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock Used in Engineering Design and Construction.
- D. ASTM D 2726 – Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- E. ASTM D 2950 – Density of Bituminous Concrete in Place by Nuclear Methods.

- F. ASTM D 1188 – Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
- G. ASTM D 1754 – Effect of Heat and Air on Asphaltic Materials (Thin-film Oven Test).

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.
- B. Mixing Plant: Conform to South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.

1.6 ENVIRONMENTAL REQUIREMENTS

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

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

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

1.7 GUARANTEE

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

1.8 TESTING

- A. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- B. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48 hours notice prior to taking any tests.
- C. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all tests shall be by the Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:
 1. Contractor gives notice the work is ready for inspection and testing, and fails to be ready for the test, and/or

2. Testing of the Contractor's work, products or materials fail, and retesting is required, and/or
 3. Contractor abuses the services or interferes with the work of the testing laboratory in the conduct of this work.
- D. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 TACK COAT

- A. Shall consist of asphalt binder (asphalt cement) or emulsified asphalt, conforming to Section 401 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction. Asphalt binder shall be PG64-22. The acceptable grades of emulsified asphalt are RS-1, MS-1, MS-2, HFMS-1, HFMS-2, SS-1, CRS-1, CRS-2, CMS-2, and CSS-1.

2.2 ASPHALT BINDER AND ADDITIVES

- A. Shall be PG64-22 and conform to Section 401 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.
- B. Anti-Stripping: Shall conform to requirements of Section 401 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.

2.3 AGGREGATES

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

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

- B. Fine Aggregate: Shall conform to the requirements of Section 401 of the South Carolina Department of Transportation Standard Specifications for Highway Construction.
- C. Coarse Aggregate: Shall be granite stone and conform to the requirements of Section 401 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.

- D. Surface Course: The surface course shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt binder in an acceptable mixing plant. The plant shall conform to South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction. The gradations, asphalt content and air voids shall be the following:

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

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

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

2.4 SOURCE QUALITY CONTROL AND TESTS

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

PART 3 – EXECUTION

3.1 EXAMINATION

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

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

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

3.2 PREPARATION

- A. Apply tack coat in accordance with Section 401 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction. Rate of application shall be 0.05 to 0.15 gallons per square yard of surface.
- B. Work shall be planned so no more tack coat than is necessary for the day's operation is placed on the surface. All traffic not essential to the work should be kept off the tack coat.
- C. Apply tack coat to contact surfaces of curbs and gutters. Apply in manner so exposed curb or gutter surfaces are not stained.
- D. Coat surfaces of manhole frames and inlet frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.3 PLACEMENT

- A. Construction shall be in accordance with Sections 401, 402, and 403 of the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.
- B. Asphaltic concrete shall not be placed on a wet or frozen surface.
- C. Compaction shall commence as soon as possible after the mixture has been spread to the desired thickness. Compaction shall be continuous and uniform over the entire surface. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks. Compaction rolling shall be complete before material temperature drops below 175° F.
- D. Areas of pavement with deficient thickness or density shall be removed and replaced at no additional cost to the Owner.

3.4 TOLERANCES

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

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

3.5 FIELD QUALITY CONTROL

- A. Acceptance of the in-place density of the binder and surface courses shall be in accordance with the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction.
- B. Density Testing: Performed in accordance with ASTM D-2726 and ASTM D-2950. Core samples for each day's operation shall be taken, tested and results reported to the Engineer the following day. The areas sampled shall be properly restored by the Contractor at no additional cost to the Owner. Nuclear gauge tests shall be taken during the asphaltic concrete placement.
 - 1. The pavement core and nuclear gauge densities shall range between 94% and 96% of the theoretical maximum density.
- C. Temperature:
 - 1. Asphaltic concrete shall not exceed 325 degrees F at any time.
 - 2. Asphaltic concrete shall not be placed once the temperature of the mix falls below 250 degrees F or the delivered temperature is more than 15 degrees F below the batch plant's delivery ticket.
 - 3. Temperature at time of loading shall be recorded on the truck delivery ticket.
- D. Frequency of Tests:
 - 1. Asphaltic Concrete – One test for each 250 tons placed.
 - a. Asphalt extraction and gradation test.
 - b. Core Sample
 - 2. Field determination of density by nuclear method every 5,000 square feet during construction of the asphaltic concrete binder/surface course.

END OF SECTION

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SECTION 02580 – THERMOPLASTIC PAVEMENT MARKINGS
EXTRUDED OR HOT SPRAY APPLICATION

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SECTION 02580**THERMOPLASTIC PAVEMENT MARKINGS
EXTRUDED OR HOT SPRAY APPLICATION****PART 1 – GENERAL****1.1 DESCRIPTION:**

- A. Work shall consist of furnishing and applying thermoplastic reflectorized pavement marking materials on surface of pavements to provide pavement markings of a color (white or yellow) and pattern as indicated on the construction drawings. Contractor shall supply all necessary equipment and materials for the installation of traffic markings.

1.2 WARRANTY:

- A. Contractor shall transfer warranty to the Owner on thermoplastic materials issued by manufacturer. Contractor shall also furnish the Owner a 12-month warranty for application. These warranties shall specify guaranteed retainage of material for a stated period beginning with the application date. Work will not be allowed to commence until warranties have been received by the Owner.

1.3 MEASUREMENT AND PAYMENT:

- A. No measurement will be made for this project.

Payment will be included in the contract lump sum price. Payment will include supplying of materials at rate specified, preparation of pavement surface, application of all materials, protection of markings, protection of traffic, and all work involved to provide pavement markings in place, complete in accordance with these specifications and special provisions, including labor, equipment, and incidentals necessary to satisfactorily complete the work specified.

PART 2 – PRODUCTS**2.1 MATERIALS:**

- A. Pavement marking material shall be a reflectorized mixture of thermoplastic binder and reflectorized glass beads. Additional glass beads are applied by dropping immediately after marking material is applied to surface of the pavement. Prior to application of the pavement marking material, surface of all pavements shall be coated with a primer-sealer material if recommended by thermoplastic manufacturer.
- B. Thermoplastic Compound: The hydrocarbon type thermoplastic compound shall meet all requirements of AASHTO M 249. Except material may be shipped in the granulated form.
- C. Glass Beads – (Drop-on): The drop-on glass beads shall meet requirements of AASHTO M 247 – Type 1.

- D. Primer-Sealer – A primer-sealer as recommended by the manufacturer of thermoplastic pavement marking material shall be utilized on all portland cement pavement surfaces and all bridge surfaces which have not been overlaid with asphalt. Primer-sealer also shall be utilized on any type of pavement prior to the placing of Railroad Crossing Symbols. Primer-sealer shall be used on asphaltic concrete pavement surfaces if recommended by the manufacturer of thermoplastic pavement marking material. Primer-sealer shall form a continuous film which will mechanically adhere to pavement and shall not discolor nor cause any noticeable change in appearance of the pavement outside of finished pavement marking.
- E. Contractor shall obtain from manufacturer of the thermoplastic binder, tests results required by AASHTO M 249 for each batch of material furnished along with a final certification stating materials furnished met requirements of contract specifications. Contractor shall obtain from manufacturer of drop-on glass beads a certification stating material furnished met requirements of contract specifications. Copies of above described affidavits shall be furnished to the Owner.

PART 3 – EXECUTION

3.1 APPLICATION PROPERTIES OF AASHTO M 249 IS EXPANDED AS FOLLOWS:

- A. Equipment – Material shall be prepared by only means of an insulated batching machine recommended or furnished by manufacturer of compound and shall consist of a special kettle for melting and heating the composition. Applicators may be either a truck mounted liner or a portable unit. "Truck mounted" shall be defined as a self-propelled vehicle with six or more wheels and an enclosed cab for housing the driver.

If contract requires extruded application, material shall be applied to the pavement by an extrusion method wherein one side of the shaping die is the pavement and the other three sides are contained by, or are part of suitable equipment for heating and controlling the flow of the material.

The batching machine shall be constructed to provide continuous mixing and agitation of material. Conveying part of equipment between the main material reservoir and final dispensing nozzle/shaping die shall be constructed to prevent accumulation and clogging. All parts of equipment which come in contact with the material shall be constructed to be easily accessible and exposable for cleaning and maintaining.

Equipment shall be constructed so all mixing and conveying parts to final dispensing nozzle/shaping die maintain material at the plastic temperature.

Equipment shall be constructed to assure continuous uniformity in dimensions of the markings.

Controls shall be set up so the operator can override set automatic cycles in order to extend a line or to begin a new cycle at any selected point.

Applicators shall provide a means for cleanly cutting off square stripe ends. Truck mounted liner shall provide a method of automatically applying "skip" or solid longitudinal lines, including right and left edge lines, of any combination of single or double line configurations (color and pattern) with machine traveling in the direction of normal traffic flow. The use of pans, aprons, or similar appliance which the nozzle/die overruns will not be permitted.

Beads shall be applied to surface of completed stripe by an automatic bead dispenser attached to the applicator. Beads are dispensed almost instantly upon the completed line.

Applicators shall be constructed to produce varying widths of traffic markings as indicated on construction drawings.

Heating of kettles and melters shall be by controlled heat transfer systems which are oil jacketed or indirect flame air jacketed. Directed flame equipment will not be allowed. All kettles and melters must be equipped with an automatic thermostatic control device and proper thermometers to control temperature of the material at manufacturer's recommended application temperature range.

Applicator and kettle must be so equipped and arranged as to satisfy requirements of the National Fire Underwriters, and all state and local requirements.

Applicators shall be mobile and maneuverable so straight lines can be followed and normal curves can be made.

- B. Construction Requirements – Traffic shall not be permitted through the project during construction.
1. Preparation of Surface – The pavement shall be dry and free of glaze, oil, dirt, grease or other foreign contaminants. Where directed by Engineer, Contractor shall buff or sand blast pavement surface for a width equal to two inches wider than the stripe to be applied in order to secure a proper surface for adequate bonding of thermoplastic material.
 2. Application of Primer-Sealer – Where used, primer-sealer shall be sprayed on the pavement surface where the lines are to be applied. Thickness of application and time on the pavement prior to thermoplastic application shall be governed by recommendations of primer-sealer manufacturer.
 3. Application of Marking Material – All longitudinal markings shall be placed with a truck-mounted applicator except where the length of a particular marking is too short, or curvature too great, to permit efficient use of the liner. Transverse markings may be applied with a portable unit.

The markings shall be straight or of uniform curvature and shall conform uniformly with tangents, curves and transitions. Symbols shall be of dimensions shown on the plans. Markings must be of dimensions and

placed as shown on the plans. The contractor shall provide sufficient control points to serve as guides for application of markings.

Finished line markings shall be free from waviness and the lateral deviation shall not exceed two (2) inches in fifteen (15) feet. Any greater deviation shall be sufficient cause for requiring the Contractor to remove and correct such markings at their own expense. Contractor shall also be required to remove and correct any symbol markings not meeting dimensional requirement shown on the plans.

Contractor shall protect the markings until dry by placing guarding or warning devices as necessary. In the event any vehicle should cross a wet marking, such marking shall be reapplied and lines made by moving vehicle removed by Contractor.

To avoid poor quality marks, markings are to be placed only when surface of pavement is dry as determined by visual inspection, when the relative humidity as reported by local weather authorities is 90% or less, and when the pavement surface temperature, as determined by means of surface thermometers, is 55 degrees F or above. Contractor shall provide appropriate surface thermometers, certified to be correct, to measure pavement temperatures during the work.

No markings shall be applied between October 15 and March 1 inclusive, except by permission of the Engineer.

Sufficient personnel experienced in handling and application of this type of material shall be provided by Contractor to assure work is completed properly.

Work shall be completed only during daylight hours, and all markings shall be sufficiently dry, before sunset, to permit crossing by traffic. All protective devices shall be removed before sunset to allow free movement of traffic at night.

Marking material shall be applied at a temperature providing best adhesion to the pavement and shall be between 380 degrees F and 420 degrees F or as recommended by the manufacturer. The material shall be heated uniformly throughout and shall have uniform disbursement of binder, pigment, and glass beads when applied to surface of the pavement.

All extruded lines 12 inches or less shall be applied with a die equal to the width of the line. All lines greater than 12 inches may be applied with two dies, the total widths of which equal the width of the line.

4. Rate of Application

- a. Marking material shall be applied at the specified widths and at a rate to result in a new material thickness at center of line as specified below.

5. Type of Marking

- a. Edge lines and median lines (5" solid white, 5" solid yellow and 5" broken yellow). 90 mils

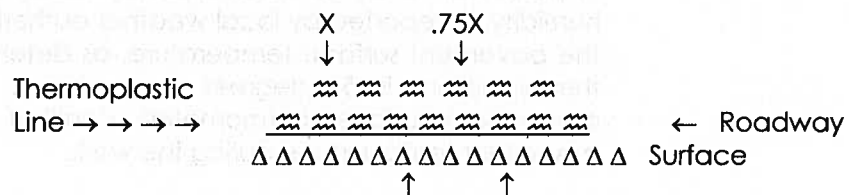
Lane lines (5" broken white) 90 mils

Center lines on two – lane roadways (5" broken yellow and 5" solid yellow) 90 mils

- b. All others 125 mils

The diagram below refers to applications of all thicknesses.

The edge of the line shall be not thinner than 75% of the center thickness.



NO SCALE

- c. Glass Beads – “Drop-on” glass beads shall be mechanically applied to surface of marking material immediately after material is applied to the pavement surface, and while marking material is still molten so beads will be held by and mechanically embedded in surface of material. Beads shall be uniformly distributed over the minimum rate of 12 pounds per 100 square feet of stripe. Drop-on beads shall be applied mechanically.

3.2 OBSERVATION AND ACCEPTANCE OF WORK:

- A. All thermoplastic markings shall be checked both day and night to determine whether the intent of these specifications has been achieved. Any markings failing to have satisfactory appearance, either day or night, shall be reapplied at Contractor's expense.

Final acceptance of thermoplastic pavement markings will be delayed for a period of 30 days after completion to permit observation of performance. Contractor shall be required to replace any markings or markers that, in the opinion of Owner, have not performed satisfactorily during this 30-day period due to defective materials and workmanship in manufacture and application.

Application of Pavement Markings and Non-recessed Pavement Markers – When pavement markings (centerline, lane lines, and edge lines) and non-recessed pavement markers are applied on a roadway opened to traffic and in a continuous operation of moving vehicles and equipment, the following minimum warning devices shall be required.

1. The vehicle applying the pavement markings shall have sequential or flashing arrows as directed by Engineer.
2. A shadow vehicle shall maintain at least a distance of 50' behind the vehicle applying pavement markings and shall have an acceptable sequential or flashing arrow board.

Application of pavement markings shall be accomplished without stopping traffic except when directed by the Owner. If Owner allows temporary closing of any part of the traveled width of any pavement, either on main roadway or intersecting roads and drives, and thereby restrict traffic, Contractor shall provide all barricades, lights, flagmen and such other protection to traffic as may be necessary for protection of work and safety of public.

Contractor shall at all times set up and operate equipment to encroach as little as possible upon the traveled width of any pavement opened to traffic.

Contractor shall submit a traffic control plan for application of thermoplastics. The plan will have to be reviewed and accepted by Owner before work begins.

END OF SECTION.

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SECTION 02720**STORM DRAINAGE****PART 1 – GENERAL****1.1 SECTION INCLUDES**

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

1.2 RELATED SECTIONS

OMITTED

1.3 OPTIONS

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

1.4 REFERENCES (Latest Revision)

- A. ASTM D 3740 – Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329 – Agencies Engaged in Construction Inspection and/or Testing.
- C. ASTM C 76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- D. ASTM C 443 – Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- E. ASTM B 745/B 745M – Corrugated Aluminum Pipe for Sewers and Drains.
- F. ASTM D 1056 – Flexible Cellular Materials – Sponge or Expanded Rubber.
- G. ASTM F 2306/F 2306M – 12 to 60-Inch (300 to 1,500 mm) Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
- H. ASTM D 1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- I. ASTM D 1752 – Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- J. ASTM D 2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.

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

1.5 QUALITY ASSURANCE

- A. Material Review – Contractor will furnish the Engineer and Owner a description of all material before ordering. Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer – Material and equipment shall be standard products of a manufacturer who has manufactured them for a minimum of 2 years and provides published data on their quality and performance.
- C. Subcontractor – A subcontractor for any part of the work must have experience on similar work, and if required, furnish Engineer with a list of projects and Owners or Engineers who are familiar with their competence.
- D. Design – Devices, equipment, structures, and systems not designed by Engineer and Contractor wishes to furnish, shall be designed by either a Registered Professional Engineer or by someone the Engineer accepts as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or Owner before ordering.

- E. Testing Agencies – Soil tests shall be taken by a testing laboratory operating in accordance to ASTM D-3740 and E-329 and be acceptable to the Engineer prior to engagement. Mill certificates of tests on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests, spot checked by an outside laboratory and furnishes satisfactory certificates.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

1.7 SEQUENCING AND SCHEDULING

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

1.8 ALTERNATIVES

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

1.9 GUARANTEE

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

1.10 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on the construction drawings, and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown, will not relieve the Contractor of responsibility under this requirement. "Existing Utilities Facilities" means any utility existing on the project in its original, relocated, or newly installed position. Contractor will be held responsible for cost of repairs to damaged underground facilities; even when such facilities are not shown on the drawings.
- B. The Contractor shall call for underground utility locations before starting work. Underground utilities location service can be contacted at [1-800-282-8411 (GA)] [1-888-721-7877 (SC)] [1-888-632-4949 (NC)] or 811.

1.11 MEASUREMENT AND PAYMENT

- A. Pipe Culverts and Storm Drains – Length of pipe will be paid for on a linear foot basis, as measured along the centerline, from end of pipe to end of pipe, end of pipe to center of structure or center of structure to center of structure. Payment of which will constitute full payment for all pipe, joints, filter fabric and bedding, including trenching, dewatering, excavation, backfill and compaction, surface clean-up, and all incidental labor and material necessary to complete the construction of pipe as required by this section of specifications.
- B. Drainage Structures – Payment will be made on a contract unit price basis. Payment will constitute full payment for all dewatering, excavation, formwork, precast concrete, backfill, compaction, frames, gratings or covers, concrete, brick and all miscellaneous materials, surface clean-up and labor necessary to complete the construction.
- C. Headwalls – Payment will be made on a contract unit price of each type. Payment will constitute full compensation for dewatering, excavation, formwork, all materials, and incidentals necessary to complete the construction.
- D. Sheeting and Bracing – Will not be measured for direct payment. All costs and charges in connection therewith shall be reflected and included in the item of work to which it pertains.
- E. Ditch and Swale Excavation – Excavations required for the construction of new ditches or swales and regrading of existing ditches or swales shall be included in earthwork cost.
- F. Connect Pipe to Existing Structures – Will not be measured for direct payment. All costs and charges in connection therewith shall be reflected and included in the item of work to which it pertains.
- G. Pipe Video – Payment will be made at the contract unit price per linear foot. Payment will include all equipment, labor, and materials necessary to televise and video record 50% of pipes under roadways as chosen by the Engineer. Contractor shall provide Engineer with one copy of the video recording.

1.12 TESTING

- A. Laboratory tests for moisture density relationship for fill materials shall be in accordance with ASTM D 1557, (Modified Proctor).
- B. In place density tests in accordance with ASTM D 1556 or ASTM D 6938.
- C. Testing laboratory shall operate in accordance with ASTM D 3740 and E 329 and be acceptable to the Engineer.
- D. Testing laboratory and Project Engineer/Project Representative shall be given a minimum of 48-hours notice prior to taking any tests.
- E. Owner shall select and engage the testing laboratory. Testing laboratory shall be responsible to the Owner and Owner's Engineer. Payment for laboratory and all

tests shall be by Owner, except Owner specifically reserves the right to deduct from Contractor's payment, expenses and charges of testing laboratory when:

1. Contractor gives notice work is ready for inspection and testing, and fails to be ready for the test, and/or
 2. testing of the Contractor's work, products, or materials fail, and retesting is required, and/or
 3. Contractor abuses the services or interferes with work of testing laboratory in conduct of this work.
- F. Test results shall be furnished to the Engineer prior to continuing with associated or subsequent work.

PART 2 – PRODUCTS

2.1 PIPE

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

2.2 DRAINAGE STRUCTURES

- A. Details – See plans.
- B. Concrete – Reinforced and non-reinforced.
1. Minimum compressive strength = 3,000 p.s.i. at 28 days.
 2. Reinforcing shall be covered by a minimum 1 inch of concrete for top slabs and 1-1/2 inches for walls and bases and 3 inches where concrete is deposited directly against the ground.
 3. Expansion joint filler materials shall conform to ASTM D 1751 or D 1752.
- C. Mortar – Connection of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C-150, Type I or II. The sand shall conform to ASTM C-144

and shall be of an accepted gradation. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 25% of cement volume used. Hydrated lime shall conform to ASTM C-207, Type S. Quantity of water in the mixture shall be sufficient to produce a workable mortar, but shall in no case exceed 7 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes from time ingredients are mixed with water.

- D. Brick Masonry – Brick shall conform to ASTM Specification C-62, Grade SW or C-55, Grade S. Mortar for jointing and plastering shall consist of one part Portland cement and two parts fine sand. Lime may be added to the mortar in an amount not more than 25% of the cement volume used. Joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of structure. Brick structures shall be plastered with 1/2 inch of mortar over entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course, and for round structures, brick shall be laid radially with every sixth course a stretcher course.
- E. Precast – Shall be constructed in accordance with ASTM C-478, C-913, or C-1433 and conform to details on the project drawings.
1. Joints – Shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B "Tylox" conforming to ASTM C443 and mastic shall be "Ram-nek" or equivalent with primer. Primer shall be applied to all contact surfaces of manhole joints at the factory in accordance with manufacturer's instructions.
 2. Steps – Shall be polypropylene equivalent to M.A. Industries, Type PS-1 or PS-1-PF. Steps shall be installed at the manhole factory and in accordance with recommendations of step manufacturer. Manholes will not be acceptable if steps are not installed accordingly.
 3. Leaks – No leaks in the manhole will be acceptable. All repairs made from inside the manhole shall be made with mortar composed of one part portland cement and two parts clean sand; mixing liquid shall be straight bonding agent equivalent to "Acryl 60."
- F. Frame, cover & grating shall conform to details shown on the project drawings. Grates in pavement and in other flush-mounted type surfaces shall be of a "bicycle-safe" configuration consisting of 45 degree diagonal bars or slotted grates with a maximum clear opening of 1 inch and a maximum length of 9-inches. In any case, the long dimension of openings should be located transverse to direction of traffic when possible.

2.3 FILTER FABRIC

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

2.4 TRACING WIRE

OMITTED

2.5 SOILS AND STONE AGGREGATES

A. Stone aggregate shall be clean crushed granite or concrete meeting the gradation requirements of grade No. 57.

B. Soils used for bedding, haunching, and initial backfill shall be as shown in the following table and shall meet requirements and classifications of ASTM D2321 and ASTM D2487.

Soil No.	Soil Description	ASTM D2321 Classification	ASTM D2487 Classification
1	Well-graded sand with fines	SW	SP
2	Medium sand	SM	SM
3	Coarse sand	SC	SC
4	Very coarse sand	VC	VC
5	Coarse sand with fines	SW	SP
6	Medium sand with fines	SM	SM
7	Coarse sand with fines	SC	SC
8	Very coarse sand with fines	VC	VC
9	Well-graded sand with fines	SW	SP
10	Medium sand with fines	SM	SM
11	Coarse sand with fines	SC	SC
12	Very coarse sand with fines	VC	VC

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

2.6 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.1 ON SITE OBSERVATIONS OF WORK

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

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

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

3.2 EXCAVATION FOR PIPE AND STRUCTURES

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

3.3 TRENCHING FOR PIPE

- A. Trenching for Pipe – The width of trenches at any point below top of pipe shall be not greater than outside diameter of pipe plus 4 feet to permit satisfactory jointing and thorough bedding, haunching, backfilling and compacting under and around pipes. Sheet piling and bracing where required shall be placed within the trench width as specified. Care shall be taken not to over-excavate. Where

trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this re-design and increased cost of pipe or installation shall be borne by Contractor without additional cost to the Owner. When installing pipe in a positive projecting embankment installation, the embankment shall be installed to an elevation of at least 1 foot above top of pipe for a width of five pipe diameters on each side of pipe before installation of pipe.

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

3.4 PROTECTION OF UTILITY LINES

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

3.5 FOUNDATION AND BEDDING

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

1. Materials for bedding concrete pipe shall be either Class II, Class III, or Class IB if processed, to minimize migration of adjacent material.
2. Depth of bedding shall be equal to 1/24 the outer diameter of pipe or 3 inches, whichever is greater.
3. Bedding area under the center of pipe, for a width 1/3 outer diameter of pipe, known as middle bedding, shall be loosely placed. Remainder of bedding for full width of the trench shall be compacted to a minimum density of 85% for Class II bedding and 90% for Class III bedding as determined by ASTM D1557.

E. Polyethylene and Corrugated Aluminum Alloy Pipe

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

3.6 HAUNCHING, INITIAL BACKFILL, AND FINAL BACKFILL

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

3.7 PLACING PIPE

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

3.8 JOINTS IN PIPES

- A. Concrete Pipe – Joints in concrete pipe shall be either 'O' ring watertight flexible rubber or tongue and groove as indicated on the plans. Gasketed, single offset joints may be used if accepted by the Engineer. Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
1. 'O' ring and single offset joints shall meet the requirements of ASTM C443. They shall utilize either a rubber gasket with a circular cross section or a rectangular cross section. Gaskets shall have no more than one splice, except two splices of the gasket will be permitted if nominal diameter of pipe exceeds 54 inches. Manufacturer's recommendations and requirements shall be followed.
 2. Tongue and groove joints shall utilize a bituminous mastic such as Ram-Nek or accepted equivalent. The joint surfaces shall be primed according to manufacturer's recommendations. Care shall be taken to insure mastic material completely and uniformly seals the joint.
 3. All tongue and groove joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.
- B. Corrugated Aluminum Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation.
1. Installation of Gaskets – Shall be in accordance with recommendations of the manufacturer in regard to use of lubricants and cements and other special installation requirements. Gasket shall be placed over one end of a section of pipe for half the width of a gasket. The other half shall be doubled over end of same pipe. When adjoining section of pipe is in place, the double-over half of gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so gasket covers ends of pipe sections equally. Connecting bands shall then be centered over the adjoining sections of pipe, and rods or bolts placed in position and nuts tightened. The band shall be tightened evenly. Tension shall be kept on rods or bolts and gasket shall be closely observed to see it is seating properly in the corrugations.
 2. Installation of Filter Fabric at Joint – After the connecting band has been tightened; Contractor shall place one layer of filter fabric completely around exterior of joint, a minimum of 2 feet wide, centered on joint, and overlapped a minimum of 1 foot.
- C. Polyethylene Pipe – Maintain pipe alignment and prevent infiltration of fill material at joints during installation
1. Joints shall be gasketed soil-tight and water-tight bell and spigot meeting ASTM F2306. Gaskets shall meet the requirements of ASTM F477. A joint lubricant supplied by manufacturer shall be used on the gasket and bell during assembly. Spigot end of pipe shall be inserted into bell using

methods recommended by the manufacturer. Pipe shall be kept true to line and grade during assembly.

2. Installation of Filter Fabric at Joint – All polyethylene pipe joints shall receive one layer of filter fabric completely around exterior of the joint. Filter fabric shall be a minimum of 2 feet wide, centered on the joint, and overlapped a minimum of 1 foot.

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

3.9 FIELD QUALITY CONTROL

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

The minimum number of tests required shall be:

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

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

In traffic Areas. 98% of maximum laboratory density.

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

- B. It is the Contractor's responsibility to assure backfill is sufficient to limit pipe deflection to no more than 5%. When flexible pipe is used, a deflection test shall be made by the Contractor on entire length of installed pipeline, not less than 30-days after completion of all backfill and placement of any fill. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95% the inside pipe diameter. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. The device shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of

70,000 p.s.i. or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer; a pull exerted on opposite end of shaft shall produce compression throughout remote end of ball, cylinder, or circular section. Circular sections shall be spaced so the distance from external faces of front and back sections shall equal or exceed diameter of circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through by hand or by being flushed through with water, shall be cause for rejection of a run. When a deflection device is used for the test in lieu of a ball, cylinder, or circular sections described, such device shall be given acceptance prior to use. Device shall be sensitive to 1.0% of pipe diameter being measured and shall be accurate to 1.0% of the indicated dimension. Installed pipe showing deflections greater than 5% of normal pipe diameter shall be retested by a run from the opposite direction. If retest also fails, the suspect pipe shall be repaired or replaced at no cost to Owner.

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

3.10 DRAINAGE STRUCTURES

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

3.11 REMOVE AND REPLACE PAVEMENT

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

3.12 CONNECT PIPE TO EXISTING STRUCTURES

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

END OF SECTION

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SECTION 02902 - GRASSING

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SECTION 02902**GRASSING****PART 1 – GENERAL****1.1 SECTION INCLUDES**

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

1.2 RELATED WORK

- A. Civil and Landscape plans and specifications.

1.3 DELIVERY, STORAGE, AND HANDLING

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

1.4 PLANTING DATES

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

1.5 MEASUREMENT AND PAYMENT

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

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

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

PART 2 – PRODUCTS

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

2.1 SEED

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

2.2 SEEDING SCHEDULE

- A. See Construction Plans

2.3 FERTILIZER

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

2.4 LIME

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

2.5 SPRIG

OMITTED

2.6 SPRIGGING SCHEDULE

OMITTED

2.7 SOD

OMITTED

2.8 ACCESSORIES

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

2.9 PRODUCT REVIEW

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

PART 3 – EXECUTION**3.1 PREPARATION**

- A. Areas to be seeded shall be made smooth and uniform and shall conform to the finished grade indicated on plans.
- B. Remove foreign materials, plants, roots, stones, and debris from surfaces to be seeded.
- C. Grassing areas, if not loose, shall be loosened to a minimum depth of 3 inches before fertilizer, seed or sod is applied.
- D. Amendments to soils shall be incorporated into loosened 3-inch top soil layer as recommended by soils tests.
- E. Contractor shall provide Topsoil Analysis Tests performed by a State Agricultural Experiment Station, Soil and Water Conservation District, State University, or other

qualified private testing laboratory, as acceptable to Landscape Architect/Project Engineer. Soils test shall identify existing pH and nutrient levels, as well as recommended adjustments based on the type of grass to be installed.

3.2 STAND OF GRASS

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

3.3 SEEDING AND SPRIGGING DATES

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

3.4 APPLYING LIME AND FERTILIZER

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

3.5 SEEDING

- A. Seed shall be sown within 24 hours following application of fertilizer and lime and preparation of the seedbed as specified in Section 3.4. Seed shall be uniformly sown at rate specified by the use of acceptable mechanical seed drills. Rotary hand seeders, power sprayers or other satisfactory equipment may be used on steep slopes or on other areas inaccessible to seed drills.
- B. Seeds shall be covered and lightly compacted by means of cultipacker or light roller if the drill does not perform this operation. On slopes inaccessible to

compaction equipment, the seed shall be covered by dragging spiked chains, by light harrowing or by other satisfactory methods.

- C. Apply water with fine spray immediately after each area has been sown.
- D. Do not sow seed when ground is too dry, during windy periods or immediately following a rain.
- E. If permitted by the special provisions, wood cellulose fiber mulch or excelsior fiber mulch may be used.

3.6 SEED PROTECTION (STRAW MULCH)

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

3.7 SEED PROTECTION (EXCELSIOR MULCH)

OMITTED

3.8 SEED PROTECTION (WOOD CELLULOSE FIBER MULCH)

OMITTED

3.9 SPRIGGING

OMITTED

3.10 SODDING

OMITTED

PART 4 – MAINTENANCE, WARRANTY AND ACCEPTANCE

4.1 MAINTENANCE

- A. Maintain grassed surfaces until final acceptance.
- B. Maintenance shall consist of providing protection against traffic, watering to ensure uniform seed germination and to keep surface of soil damp, and repairing any areas damaged as a result of construction operations or erosion. Maintenance shall also include, but is not limited to, watering, weeding, cultivating, removal of dead material, lawn mowing, fertilizing, and other necessary operations.
- C. The Contractor shall maintain all proposed plantings until the date of substantial completion issued by the Owner.

4.2 WARRANTY

- A. All grassed areas shall be guaranteed by Contractor to be alive and healthy for a one year period from date of substantial completion issued by the Owner. A final walk through with the Owner shall be conducted at end of warranty period to

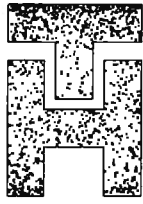
determine if any areas require replanting. At end of warranty period, sod shall show evidence of rooting to underlying soil and shall have no competitive weed growth from either the sod or from between sod joints.

- B. Any grassed area which is dead or not showing satisfactory growth shall be replaced at Contractor's expense at the end of warranty period. All replacement shall be of original quality. Replacement required because of vandalism, excessive use, or other causes beyond the control of Contractor are not part of this contract.

4.3 ACCEPTANCE

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

END OF SECTION



THOMAS & HUTTON

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J#-23728

PAVEMENT EVALUATION

**WALTERBORO ROADWAYS
COLLETON COUNTY, SOUTH CAROLINA
S&ME PROJECT NO. 1131-12-521**



PAVEMENT EVALUATION

**WALTERBORO ROADWAYS
COLLETON COUNTY, SOUTH CAROLINA
S&ME PROJECT NO. 1131-12-521**

Prepared for:

Thomas and Hutton Engineering, Inc.
682 Johnnie Dodds Boulevard, Suite 100
Mount Pleasant, South Carolina 29464

Prepared by:



620 Wando Park Boulevard
Mt. Pleasant, South Carolina 29464

November 26, 2012



November 26, 2012

Thomas and Hutton Engineering, Inc.
682 Johnnie Dodds Boulevard, Suite 100
Mount Pleasant, South Carolina 29464

Attention: Mr. Kevin Shoemaker, P.E.

Reference: **PAVEMENT EVALUATION**
Walterboro Roadways
Colleton County, South Carolina
S&ME Project No. 1131-12-521

Dear Mr. Shoemaker:

We have completed our pavement evaluation for the three roadways near Walterboro in Colleton County, South Carolina. Our services were provided in general accordance with S&ME Proposal No. 31-12-289 dated October 2, 2012. The purpose of these services was to evaluate the existing pavements and subgrade conditions at existing roadways and provide recommendations for pavement rehabilitation. This report presents our procedures, findings, and recommendations.

PROJECT INFORMATION

We understand plans are to rehabilitate four roadways near the town of Walterboro: the entrance road to the wire facility off of Industrial Road, Purple Heart Drive, and the two recreation roads (Recreation Lane 1 and Recreation Lane 2) at the baseball fields off of Thunderbolt Drive. Although currently unoccupied, we understand the wire facility entrance road will be rehabilitated to support future industrial park traffic consisting of significant heavy truck traffic. Purple Heart Drive provides access to the FloraLife facility which we understand sees mostly automobile and light truck traffic on a day-to-day basis and 12 to 15 tractor-trailers per day for two months out of the year. The Recreation Lane roadways are mostly subject to automobiles and light truck traffic with an occasional heavy truck.

This project information was based on information provided in an email from Mr. Kevin Shoemaker, P.E. with Thomas & Hutton to Mr. Michael Ulmer, P.E. of our firm on September 25th and during a subsequent telephone conversation between Messrs. Shoemaker and Ulmer on November 15, 2012.

EVALUATION METHODS

The condition of the existing pavements was visually evaluated using ASTM D 6433-07 “Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys.” A pavement condition index (PCI) value was not calculated; rather, the evaluation methods were used to help assess the condition of the existing pavements and determine the appropriate maintenance and repair.

We also cored the roadways at 19 locations to evaluate the existing pavement sections and subgrade. Test locations were spaced at approximately 300 to 450-ft intervals along Recreation Lane and the wire facility entrance road and approximately 175 to 250-ft intervals along Purple Heart Drive. Our naming convention for the test locations consisted of the prefixes RL, PH, and WF to designate Recreation Lane, Purple Heart Drive, and Wire Facility, respectively. The general site locations and approximate test locations are shown on the Site Vicinity Map (Figure 1) and Test Location Plans (Figures 2, 3, and 4) in Appendix I.

The existing pavement thicknesses were evaluated by extracting 4-in. diameter cores at 9 locations in Recreation Lanes and at 5 locations along both the Purple Heart Drive and wire facility entrance road. The asphalt and base course thicknesses, if present, were measured at each location. We then evaluated subgrade conditions at each test location by performing a 4-ft-deep hand-auger boring and dynamic cone penetration (DCP) testing at 2-in. increments using a Kessler DCP. The soils encountered were visually classified in the field using the Unified Soil Classification System (USCS). The DCP data was used to correlate in-situ subgrade CBR values. Upon completion of the borings, each bore-hole was backfilled with soil cuttings and patched with asphalt cold patch.

A more detailed description of our field testing procedures, the Hand-Auger Boring Logs, and the DCP data are included in Appendix II.

FINDINGS

Purple Heart Drive

Purple Heart Drive is the entrance roadway to the FloraLife facility located off of Thunderbolt Drive near Walterboro in Colleton County, South Carolina. The roadway extends approximately 870 ft to the west from Thunderbolt Drive to Tuskegee Airmen Drive. The existing roadway is a two-lane paved road with a rural ditch cross section.

The existing pavement was in poor condition. Medium to high severity block cracking was observed along the entire roadway. A significant portion of the pavement near the entrance drives to the building had completely failed resulting in very large potholes or large portions of the roadway with no asphalt. Based on our exploration, the existing pavement section consisted of asphalt ranging in thickness from approximately 1 to 1¼ in. The coring results are summarized in Table 1. No aggregate base course material was encountered at four of the test locations. In PH C-5 near Tuskegee Airmen Drive, approximately 6½ in. of base material was encountered. Photographs of the existing pavement conditions are included in Appendix III.

Table 1 – Purple Heart Drive Coring Results

Core No.	Asphalt (in.)	GABC (in.)
PH C-1	1¼	NP
PH C-2	1¾	NP
PH C-3	1¼	NP
PH C-4	1	NP
PH C-5	1½	6½

NP = Not present

The borings indicate the subgrade generally consists of relatively clean sands (SP). It was unclear whether or not the material encountered immediately below the roadway was fill; however, it is likely that some portion of the material is fill. The DCP data indicate in-situ CBR values of at least 10 or higher at all test locations. None of the subgrade soils appeared to be wet or unstable. Groundwater was not encountered in any of the borings.

Recreation Lane

The Recreation Lane roadways are located at the baseball fields off of Thunderbolt Drive near Walterboro in Colleton County, South Carolina. The roadways enter the recreational park near the northern and southern portions of the property and extend to the west from Thunderbolt Drive. The two roads join together just before the Recreation Center building and continue on to a new parking lot and playing fields being constructed to the southwest of the building. The existing roadways are two-lane paved roads with a rural ditch cross section.

The existing pavement was in fair to poor condition. Low to medium severity block cracking was observed along much of the roadways with the worst cracking occurring between test locations RL C-7 and RL C-9 and between RL C-2 and RL C-4. Some medium to high severity shoulder drop-off was observed near RL C-8 and between RL C-3 and RL C-4. Also, high severity bumps were observed adjacent to a group of trees near location RL C-3. The bumps were approximately 1½ to 2½ in. in height and appear to be from tree roots growing beneath the pavement. Photographs of the existing pavement conditions are included in Appendix III.

The existing pavement section consisted of asphalt ranging in thickness from approximately 1¼ to 3½ in. The coring results are summarized in Table 2. No aggregate base coarse material was encountered at any of our test locations.

Table 2 – Recreation Lane Coring Results

Core No.	Asphalt (in.)	GABC (in.)	Core No.	Asphalt (in.)	GABC (in.)
RL C-1	3	NP	RL C-6	2¼	NF
RL C-2	1¾	NP	RL C-7	3½	NP
RL C-3	2¾	NP	RL C-8	3	NP
RL C-4	3¾	NP	RL C-9	1¾	NP
RL C-5	3	NP			

NP = Not present

The borings indicate the subgrade generally consists of relatively clean sands (SP); however, immediately beneath the pavement, the borings encountered approximately 3 to 6 in. of clayey sand which were classified as SP-SC to SC. It was unclear whether or not the material encountered immediately below the roadway was fill; however, it is likely that some portion of the material is fill. The DCP data indicate in-situ CER values of at least 10 or higher at all test locations. None of the subgrade soils appeared to be wet or unstable. Groundwater was not encountered in any of the borings.

Wire Facility Entrance Road

The entrance road to the currently unoccupied wire facility is located off of Industrial Road near Walterboro in Colleton County, South Carolina. The roadway extends approximately 1,250 ft to the north from Industrial Road. The existing roadway is a two-lane paved road with a rural ditch cross section.

The pavement was in fair to poor condition. Medium to high severity block and fatigue cracking was observed along the entire roadway. A large portion of the pavement near the secondary entrance drives to the building had completely failed resulting in large potholes. Some of the potholes had been patched with asphalt or concrete; however, we would consider the patching to be medium to high severity based on the deterioration and poor rideability.

Based on our exploration, the existing pavement section consisted of asphalt ranging in thickness from approximately 1¼ to 1¾ in. The coring results are summarized in Table 3. No aggregate base coarse material was encountered at any of the test locations. Photographs of the existing pavement conditions are included in Appendix III.

Table 3 – Wire Facility Entrance Road Coring Results

Core No.	Asphalt (in.)	GABC (in.)
WF C-1	1¼	NP
WF C-2	1½	NP
WF C-3	1¾	NP
WF C-4	1½	NP
WF C-5	1½	NP

NP = Not present

The borings indicate the subgrade generally consists of relatively clean sands (SP). However, immediately beneath the asphalt, the borings encountered approximately 4 to 10 in. of clayey sand (SC). It was unclear whether or not the material encountered immediately below the roadway was fill; however, it is likely that some portion of the material is fill. The DCP data indicate in-situ CBR values of at least 10 or higher at all test locations. None of the subgrade soils appeared to be wet or unstable. Groundwater was not encountered in any of the borings.

PAVEMENT DESIGN AND REHABILITATION RECOMMENDATIONS

Based on our observations, the exploration data, and the provided traffic information, the following sections present our recommendations for rehabilitation of the existing pavements. Evaluation of new flexible (asphalt) pavements was performed using the *AASHTO Guide for Design of Pavement Structures* and associated literature, and materials are referenced to the SCDOT “2007 Standard Specifications for Highway Construction”.

Purple Heart Drive

Purple Heart Drive must support heavy truck traffic for two to three months of the year, and the existing pavement structure is too deteriorated to be practically reused. We recommended the existing pavement be completely removed and replaced with a new flexible pavement section consisting of 3 in. of asphaltic concrete (SCDOT Type C) and 6 in. of GABC to support heavy truck traffic. The structural number of the recommended pavement section is 2.4, and our analysis indicates the allowable traffic volume for the recommended flexible pavement section is approximately 770,000 ESALs¹.

Recreation Lane

Recreation Lane roadways are subject to light traffic loads and volumes; consequently, overlaying the existing pavement will be the most economical solution. We recommend full-depth patching of fatigue-cracked areas, sealing block cracks, and overlaying the pavement with 125 psy Surface Type D. Tree roots should be completely removed from beneath the pavement. Filling of the shoulders in areas near RL C-2 and between RL C-3 and RL C-4 may also be

¹ Equivalent 18-kip single axle load (ESAL). For example, a legally-loaded tandem axle tractor-trailer has an ESAL of up to 2.5, while a passenger car has an ESAL of approximately 0.0002.

necessary. The structural number of the overlaid pavement section is 1.3, and the allowable traffic volume is approximately 21,400 ESALs.

Although the existing pavement and subgrade appear to be stable, our experience indicates there is some risk that the existing block cracking will reflect through the overlay within a relatively short time frame. While we do not anticipate this will have an adverse effect on pavement performance, it will be unsightly. If this risk of reflective cracking is not acceptable, then in-situ reclamation or complete removal and replacement would be necessary. Both options would have a significantly higher cost.

Wire Facility Entrance Road

We understand the wire facility road will support significant, year-round heavy truck traffic as the site is redeveloped into an industrial park. We recommended the existing pavement be completely removed and replaced with a new flexible pavement section consisting of 3 in. of asphaltic concrete (SCDOT Type C) and 8 in. of GABC. The structural number of the recommended pavement section is 2.76, and our analysis indicates the allowable traffic volume for the recommended pavement section is approximately 1,895,000 ESALs.

Construction Considerations

Construction traffic has not been included in our analysis of new pavements, and construction traffic should be restricted from prepared subgrades and new pavements. If new pavements must support construction traffic, a thicker section or staged construction should be used or the pavement life will be reduced.

Based on our experience with similar sites, properly prepared in-situ sandy soils or well-compacted controlled fill will provide a CBR of at least 10. The CBR values should be confirmed during grading by engineering evaluation and field and laboratory testing.

All materials and workmanship should be in accordance with the South Carolina Department of Transportation's *Standard Specifications for Highway Construction*, 2007 Edition.

A stable subgrade is very important to pavement performance. Immediately prior to paving, the subgrade should be proofrolled, and any unstable areas should be repaired as discussed above. The base course should be compacted to at least 100% of the maximum dry density as determined by the modified Proctor compaction test (ASTM D 1557). In-place field density tests should be performed by qualified CQC personnel, and the area should be methodically proofrolled under their evaluation to confirm that the base course has been uniformly compacted. The thickness should not be deficient in any area by more than 1/2 in. The asphalt pavement thickness should not be deficient by more than 1/4 in. in any area.

The performance of asphaltic concrete pavements will be dependent upon a number of factors including subgrade conditions at the time of paving, drainage, and traffic. Rainwater runoff should not be allowed to seep below pavements. The pavement geometric design should provide positive drainage for the pavement surface and the subgrade.

Pavement design typically has relatively low factors of safety; therefore, it will be very important that the specifications are followed closely during pavement construction. Our analysis was based on a 15-year design life; however, some isolated areas could require repair in a shorter period of time.

LIMITATIONS OF REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

The analyses and recommendations submitted in this report are based, in part, upon data obtained from our subsurface exploration. The nature and extent of subsurface variations will not become evident until construction. If variations appear evident, then we should be given the opportunity to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the proposed roadways are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing.

We recommend that S&ME be retained to review the final design plans and specifications to confirm that earthwork and pavement recommendations are properly interpreted and implemented.

CLOSURE

We appreciate the opportunity to be of service on this project. If you have any questions concerning this report, please call.

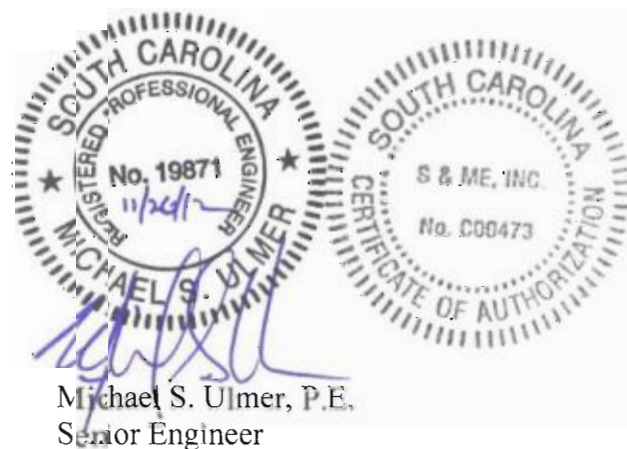
Sincerely,

S&ME, Inc.



R. Heath Forbes, P.E.
Project Engineer

RHH/MSU



Michael S. Ulmer, P.E.
Senior Engineer

APPENDIX I

Site Vicinity Map (Figure 1)

Test Location Plans (Figures 2, 3, and 4)



Note: Drawing is for general information only and should not be used for the measurement or estimation of quantities or distances.

SITE VICINITY MAP
 Pavement Evaluation
 Walterboro Roadways
 WALTERBORO, SC

Figure:
1



S&ME Project No.: 1131-12-521

November 2012

Scale: Not to Scale



○ Approximate Boring Location

Note: Drawing is for general information only and should not be used for the measurement or estimation of quantities or distances.

S&ME Project No.: 1131-12-521

November 2012

Scale: Not to Scale

**TEST LOCATION PLAN
PURPLE HEART DRIVE**

WALTERBORO, SC



Figure:

2



○ Approximate Boring Location

Note: Drawing is for general information only and should not be used for the measurement or estimation of quantities or distances.

TEST LOCATION PLAN
RECREATION LANE
WALTERBORO, SC

Figure:
3

S&ME Project No.: 1131-12-521

November 2012

Scale: Not to Scale





○ Approximate Boring Location

Note: Drawing is for general information only and should not be used for the measurement or estimation of quantities or distances.

S&ME Project No.: 1131-12-5211

November 2012

Scale: NOT to scale



**TEST LOCATION PLAN
WIRE FACILITY ENTRANCE ROAD**

WALTERBORO, SC

Figure:

4

APPENDIX II

Hand-Auger Boring Logs

DCP Data Sheets

Field Testing Procedures

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: PH-C1	
DATE STARTED: 11/7/12		DATE FINISHED: 11/7/12		NOTES:	
SAMPLING METHOD: Hand Auger		PERFORMED BY: H. Forbes			
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT - 1 1/4 INCHES</u> <u>SLIGHTLY SILTY SAND (SP-SM)</u> dark brown, fine, moist			
1		<u>SAND (SP)</u> light grayish brown to dark brown, fine, moist --- Brownish gray --- Light yellowish brown			
2					
3					
4		Boring terminated at 4 ft			



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-52'		HAND AUGER BORING LOG: PH-C2		
DATE STARTED:		11/7/12	DATE FINISHED:		11/7/12	
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		H. Forbes	
WATER LEVEL:		Not encountered at time of boring				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION			ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT = 1 3/4 INCHES</u> <u>SAND (SP)</u> brown to reddish brown, fine, moist, trace clay --- Grayish brown, trace small roots --- Light yellowish brown --- Light reddish brown with gray, trace silt				
1						
2						
3						
4		Boring terminated at 4 ft				



1 PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 2.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: PH-03	
DATE STARTED: 11/7/12		DATE FINISHED: 11/7/12		NOTES:	
SAMPLING METHOD: Hand Auger		PERFORMED BY: H. Forbes			
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT = 1 1/4 INCHES</u>			
		<u>SLIGHTLY CLAYEY SAND (SP-SC)</u> reddish brown, fine, moist			
1		<u>SAND (SP)</u> light grayish brown, fine, moist			
2		--- Light brown			
3		--- Dark gray to black lense, trace small roots --- Light brownish gray			
4		Boring terminated at 4 ft			



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT: **Walterboro Roadways**
Walterboro, SC
1131-12-521

HAND AUGER BORING LOG: PH-C4

DATE STARTED: **11/7/12** DATE FINISHED: **11/7/12**

NOTES:

SAMPLING METHOD: **Hand Auger** PERFORMED BY: **H. Forbes**

WATER LEVEL: **Not encountered at time of boring**

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		ASPHALT ≈ 1 INCH		
		SAND (SP) brown, fine, moist, trace clay		
1		--- Light brown with gray, fine, moist		
2		--- Light yellowish brown		
3		--- Trace small roots		
4		Boring terminated at 4ft		



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 2.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: PH-C5	
DATE STARTED: 11/7/12		DATE FINISHED: 11/7/12		NOTES:	
SAMPLING METHOD: Hand Auger		PERFORMED BY: J. Forbes			
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT = 1 1/2 INCHES</u> <u>CRUSHED GYCLITE = 6 1/2 INCHES</u>			
1		<u>SAND (SP)</u> brown with gray, fine, moist --- Light brown			
2		--- Light yellow			
3					
4		<u>SLIGHTLY CLAYEY SAND (SP-S)</u> reddish brown, fine, moist --- Encountered small root Boring terminated at 4 ft			



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: IR-C1		
DATE STARTED:		11/7/12	DATE FINISHED:		11/7/12	
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		H. Forbes	
WATER LEVEL:		Not encountered at time of boring				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION			ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT = 3 INCHES</u>				
		<u>SILTY SAND (SM)</u> brown, fine, moist				
1		<u>SAND (SP)</u> grayish brown, fine, moist --- Light yellowish brown				
2		--- Light grayish brown				
		<u>SILTY SAND (SM)</u> black, fine, moist, trace small organics, organic odor				
3		<u>SLIGHTLY SILTY SAND GP-SM</u> gray to light brownish gray, fine, moist --- Trace clay				
4		Boring terminated at 4 ft				



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: HL-C2		
DATE STARTED:		11/7/12		DATE FINISHED: 11/7/12		
SAMPLING METHOD:		Hand Auger		PERFORMED BY: H. Forbes		
WATER LEVEL:		Not encountered at time of boring				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION			ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT = 1 3/4 INCHES</u>				
		<u>SLIGHTLY CLAYEY SAND (SP-SC)</u> brown, fine, moist				
1		<u>SAND (SP)</u> brownish gray, fine, moist --- Dark gray, organic stained lense --- Light grayish brown				
2		<u>SILTY SAND (SM)</u> black, fine, moist, organic stained --- Dark gray, no longer organic stained				
3		<u>SLIGHTLY SILTY SAND (SP-SM)</u> light gray with yellow, fine, moist				
4		Boring terminated at 4 ft				






1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 2.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-291		HAND AUGER BORING LOG: RI-C3		
DATE STARTED:		11/7/12	DATE FINISHED:		11/7/12	
NOTES:						
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		H. Forbes	
WATER LEVEL: Not encountered at time of boring						
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION			ELEVATION (feet)	WATER LEVEL
		ASPHALT = 2 3/4 INCHES				
		<u>SAND (SP)</u> brown, fine, dry to moist --- Brownish gray --- Encountered 1/8" diameter roots --- Moist --- Dark gray, organic stained lense --- Light yellowish brown, trace silt --- Light gray				
1						
2						
3						
4		Boring terminated at 4 ft				






1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN, DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT: Walterboro Roadways Walterboro, SC 1101-12-201		HAND AUGER BORING LOG: FL-C4		
DATE STARTED: 11/7/12	DATE FINISHED: 11/7/12	NOTES:		
SAMPLING METHOD: Hand Auger	PERFORMED BY: H. Forbes			
WATER LEVEL: Not encountered at time of boring				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		ASPHALT = 3 1/4 INCHES		
		CLAYEY SAND (SC) brown, fine, moist		
1		SAND (SP) light reddish yellow, fine, moist		
2		--- Grayish brown		
		--- Encountered thin lense with trace organic material		
		--- Light reddish yellow		
3				
		--- Light brown		
4		Boring terminated at 4 ft		









1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 21.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Waterboro Roadways Walterboro, SC 1131-12-21		HAND AUGER BORING LOG: HL-C5	
DATE STARTED: 11/2/12		DATE FINISHED: 11/2/12		NOTES:	
SAMPLING METHOD: Hand Auger		PERFORMED BY: H. Forbes			
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT - 3 INCHES</u>			
		<u>SLIGHTLY CLAYEY SAND (SP-SC)</u> yellowish brown, fine, moist			
1		<u>SAND (SP)</u> dark brown, fine, moist, trace silt			
2		--- Yellow			
3		--- Reddish yellow			
4		Boring terminated at 4 ft			






1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1101-12-321		HAND AUGER BORING LOG: HL-C6	
DATE STARTED: 11/2/12		DATE FINISHED: 11/2/12		NOTES:	
SAMPLING METHOD: Hand Auger		PERFORMED BY: H. Forbes			
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT</u> - 2 1/4 INCHES			
		<u>SLIGHTLY CLAYEY SAND (SP-SC)</u> yellowish brown, fine, moist			
		<u>SLIGHTLY SILTY SAND (SP-SM)</u> dark brown, fine, moist			
1		--- <u>SAND (SP)</u> yellow and brown, fine, moist			
2		--- Yellow			
3		--- Reddish yellow			
4		Boring terminated at 4 ft			





1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 21.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: RL-C7		
DATE STARTED:		11/7/12		DATE FINISHED: 11/7/12		
SAMPLING METHOD:		Hand Auger		PERFORMED BY: H. Forbes		
WATER LEVEL:		Not encountered at time of boring				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION			ELEVATION (feet)	WATER LEVEL
		ASPHALT = 3 1/2 INCHES.				
		CLAYEY SAND (SC) reddish brown, fine, moist				
1		SAND (Sp) brown, fine, moist				
2						
3		--- Light yellowish brown				
		--- Dark gray				
		--- Light yellowish brown				
4		Boring terminated at 4 ft				



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12321		HAND AUGER BORING LOG: RL-C8	
DATE STARTED: 11/7/12		DATE FINISHED: 11/7/12		NOTES:	
SAMPLING METHOD: Hand Auger		PERFORMED BY: H. Forbes			
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL	
		<u>ASPHALT = 3 INCHES.</u>			
		<u>SLIGHTLY CLAYEY SAND (SP-SC)</u> reddish brown, fine, moist			
1		<u>SAND (SP)</u> yellowish brown, fine, moist			
2					
3					
4		Boring terminated at 4 ft			



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 12.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT: **Walterboro Roadways**
Walterboro, SC
117112524




HAND AUGER BORING LOG: RL-C9

DATE STARTED: **11/7/12** DATE FINISHED: **11/7/12**

NOTES:




SAMPLING METHOD: **Hand Auger** PERFORMED BY: **H. Forbes**

WATER LEVEL: **Not encountered at time of boring**

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
		ASPHALT = 1 3/4 INCHES		
		SLIGHTLY CLAYEY SAND (SP,SC) brown, fine, moist		
1		SAND (SP) brown, fine, moist --- Light yellowish brown		
2				
3				
4		--- Light brown		
Boring terminated at 4 ft				



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN. DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: WF-C2	
DATE STARTED:		11/7/12	DATE FINISHED:		11/7/12
NOTES:					
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		H. Forbes
WATER LEVEL: Not encountered at time of boring					
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION		ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT = 1 1/2 INCHES</u>			
		<u>CLAYEY SAND (SC)</u> reddish brown, fine, moist			
		<u>SAND (SP)</u> grayish brown, fine, moist			
1		--- Light yellowish brown			
		--- Gray and brown			
2		--- Light brown			
3		--- Encountered dark brown silty sand lense with trace organics (2" thick)			
		--- Light yellow			
4		Boring terminated at 4 ft			



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT: **Walterboro Roadways**
Walterboro, SC
1131-12-521

HAND AUGER BORING LOG: WF-C3

DATE STARTED: **11/7/12** DATE FINISHED: **11/7/12**

NOTES:

SAMPLING METHOD: **Hand Auger** PERFORMED BY: **H. Forbes**

WATER LEVEL: **Not encountered at time of boring**

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
	ASPHALT = 1 3/4 INCHES			
	CLAYEY SAND (SC) reddish brown, fine, moist --- With white			
1	SAND (SP) light brown, fine, moist			
2				
3				
4		Boring terminated at 4 ft		



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 2.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT: **Walterboro Roadways**
Waterboro, SC
131-12-521







HAND AUGER BORING LOG: WF-C4

DATE STARTED: **11/2/12** DATE FINISHED: **11/2/12**

NOTES:

SAMPLING METHOD: **Hand Auger** PERFORMED BY: **H. Forbes**

WATER LEVEL: **Not encountered at time of boring**

Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION (feet)	WATER LEVEL
0		ASPHALT - 1 1/2 INCHES		
0 - 0.5		FILL: CLAYEY SAND (SC) reddish brown, fine, moist, trace fine gravel pieces		
0.5 - 1.0		SAND (SP) light yellow and brown, fine, moist		
1.0 - 2.0				
2.0 - 3.0				
3.0 - 4.0				
4.0	Boring terminated at 4 ft			



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

PROJECT:		Walterboro Roadways Walterboro, SC 1131-12-521		HAND AUGER BORING LOG: WF-C5		
DATE STARTED:		11/2/12	DATE FINISHED:		11/2/12	
SAMPLING METHOD:		Hand Auger	PERFORMED BY:		H. Forbes	
WATER LEVEL:		Not encountered at time of boring				
Depth (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION			ELEVATION (feet)	WATER LEVEL
		<u>ASPHALT=1 1/2 INCHES</u>				
		<u>CLAYEY SAND (SC)</u> light brownish red, fine, moist				
		<u>SAND (SP)</u> light yellow and brown, fine, moist				
1						
2						
3		--- White with yellow				
		--- Yellowish brown				
4		Boring terminated at 4 ft				



1. PENETRATION RESISTANCE IS THE NUMBER OF BLOWS OF A 10.1 LB HAMMER FALLING 22.6 IN., DRIVING A 0.79 IN. O.D. 60 DEGREE CONE 1.75 IN.

DCP TEST DATA

File Name: Purple Heart C-1

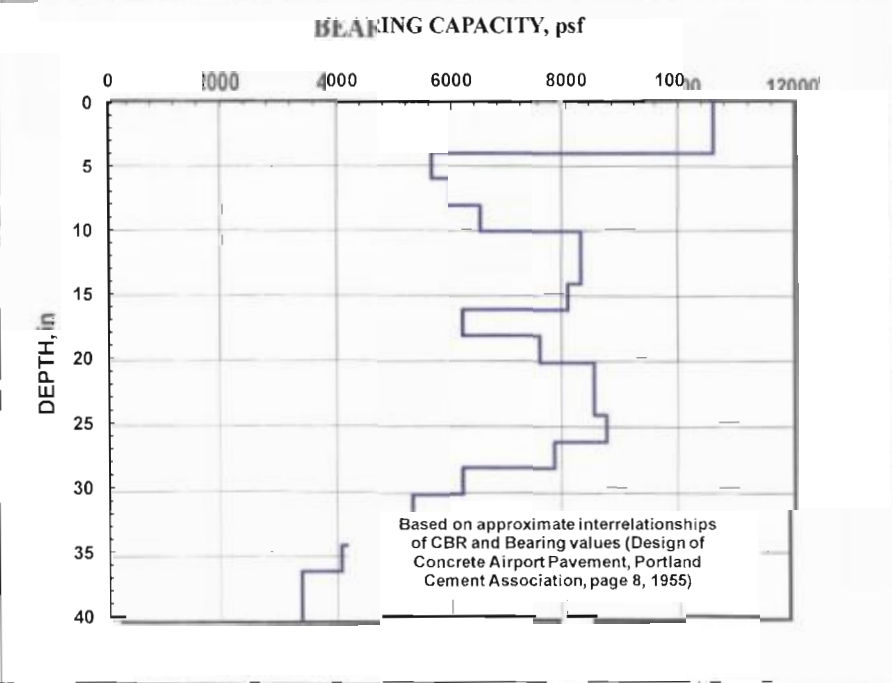
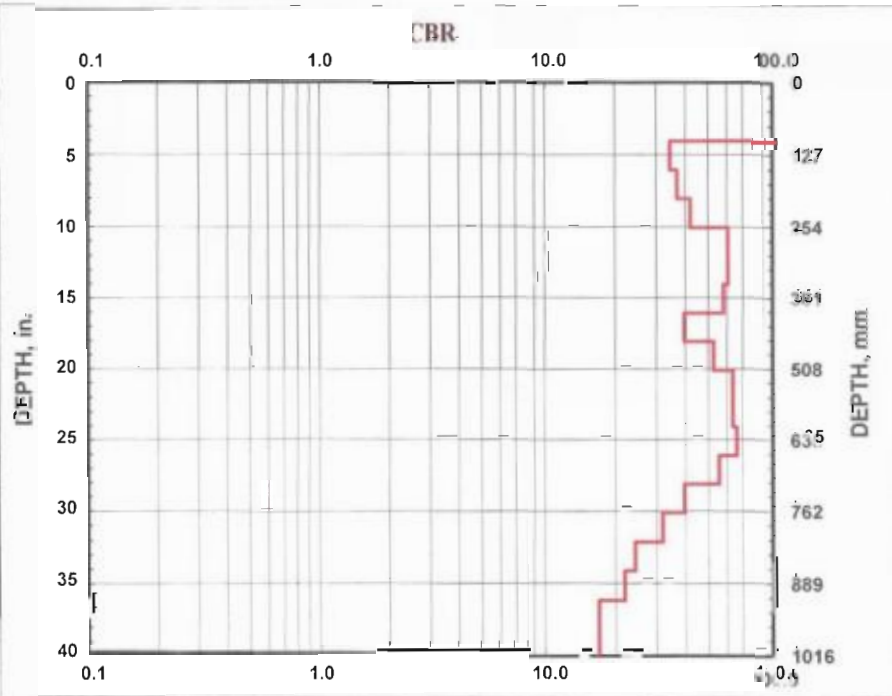
Project: Walterboro Roadways
 Location: Walterboro, SC

Date: 7-Nov-11
 Soil Type(s): Sand

- Hammer
- 10.1 lbs.
 - 17.6 lbs.
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
15	153	2
16	204	2
18	255	2
25	306	2
25	357	2
24	408	2
17	459	2
22	510	2
26	561	2
26	612	2
27	663	2
23	714	2
17	765	2
14	816	2
11	867	2
10	918	2
8	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Purple Heart C-2

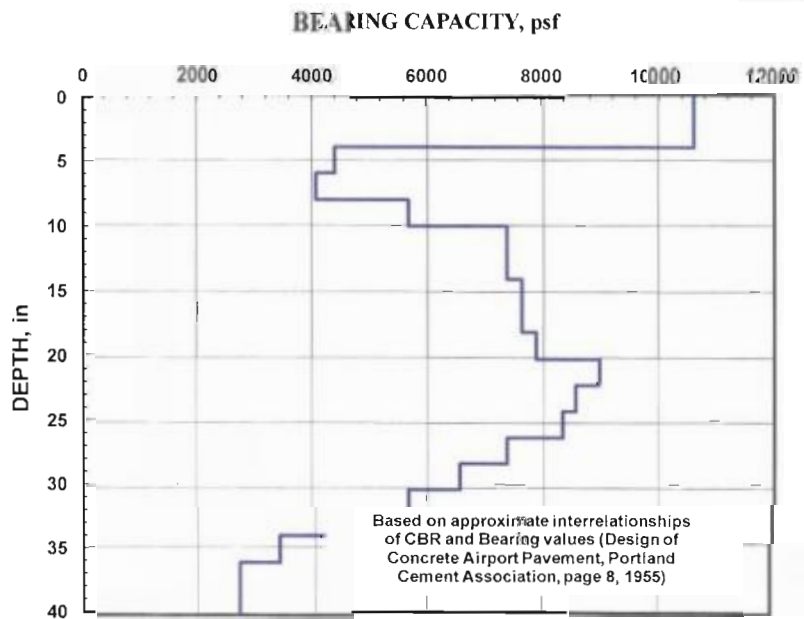
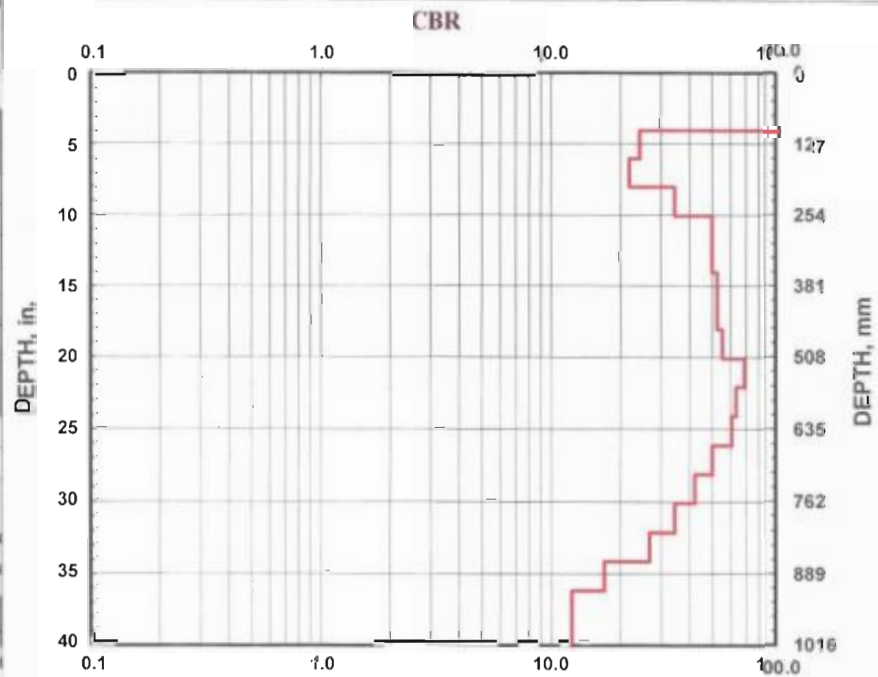
Project: Walterboro Roadways
 Location: Walterboro, SC

Date: 7-Nov-12
 Soil Type(s): Sand

- Hammer
- 10.1 lbs.
 - 17.6 lbs.
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

Nc of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
11	153	2
10	204	2
15	255	2
21	306	2
21	357	2
22	408	2
22	459	2
23	510	2
28	561	2
26	612	2
25	663	2
21	714	2
18	765	2
15	816	2
12	867	2
8	918	2
6	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Purple Heart C-3

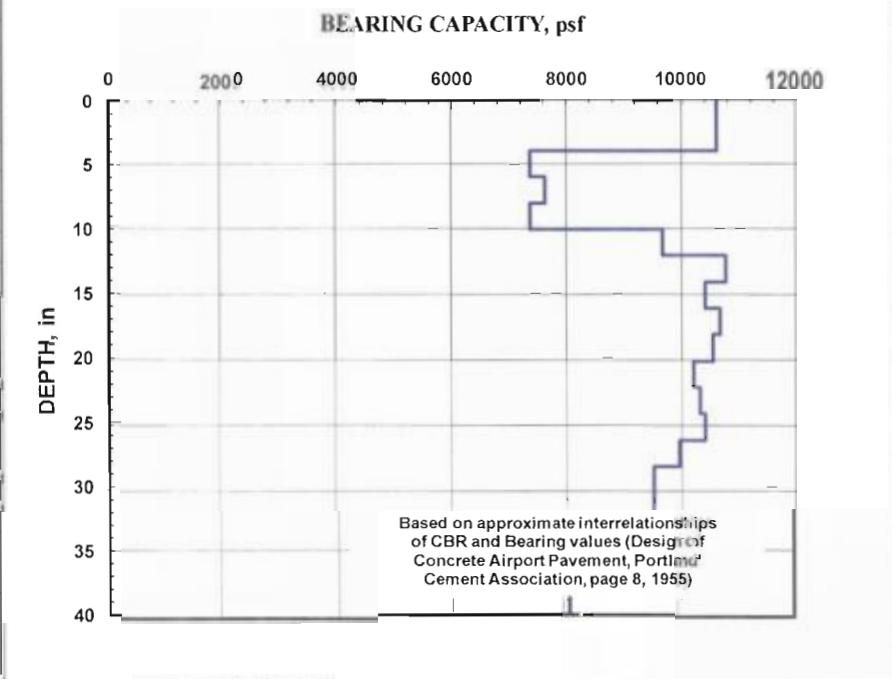
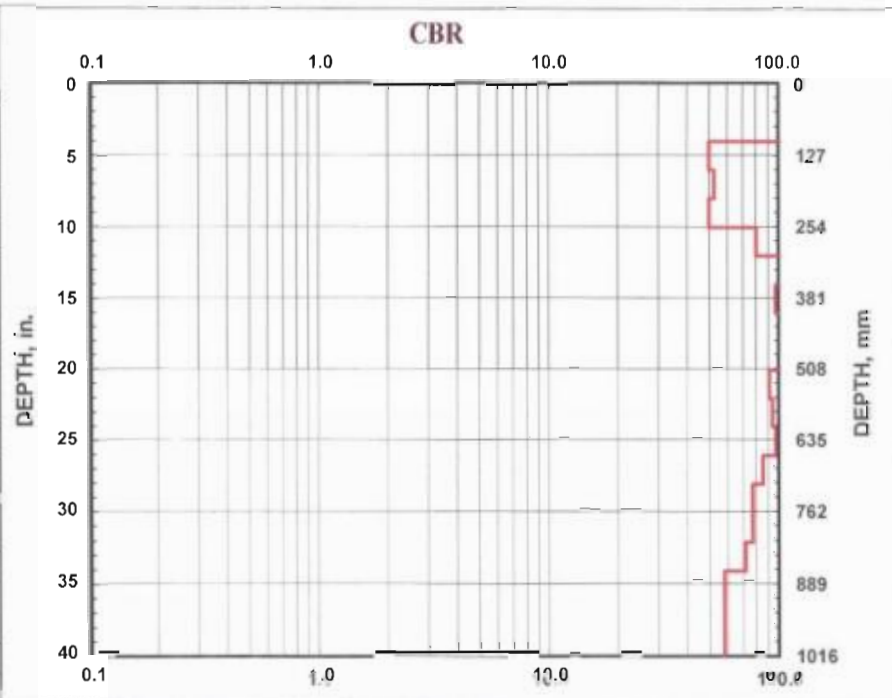
Project: Walterboro Roadways
 Location: Walterboro, SC

Date: 7-Nov-11
 Soil Type(s): Sand

- Hammer
- 10.1 lbs.
 - 7.5 lbs.
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
21	153	2
22	204	2
21	255	2
32	306	2
45	357	2
38	408	2
50	459	2
52	510	2
36	561	2
37	612	2
38	663	2
34	714	2
31	765	2
31	816	2
29	867	2
24	918	2
24	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Purple Heart C-4

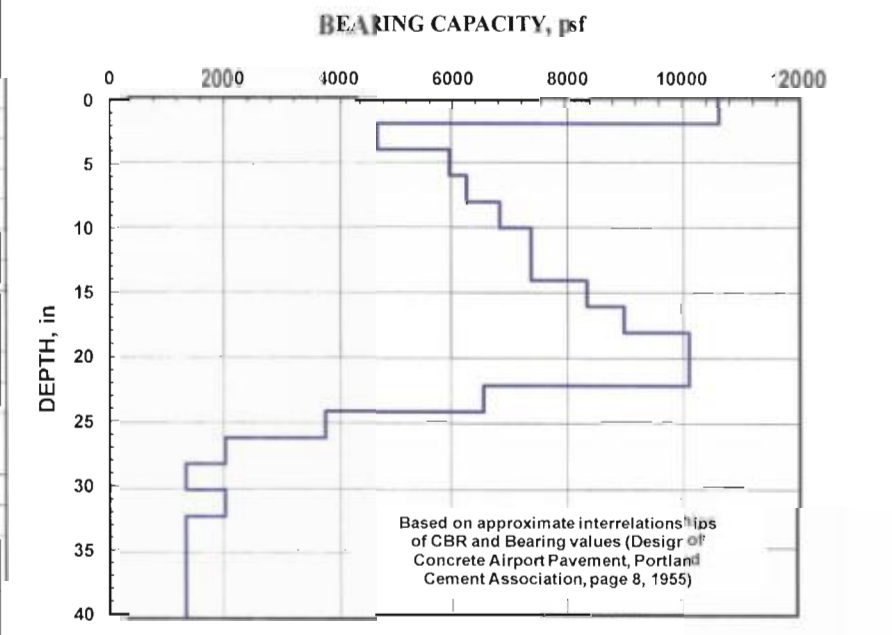
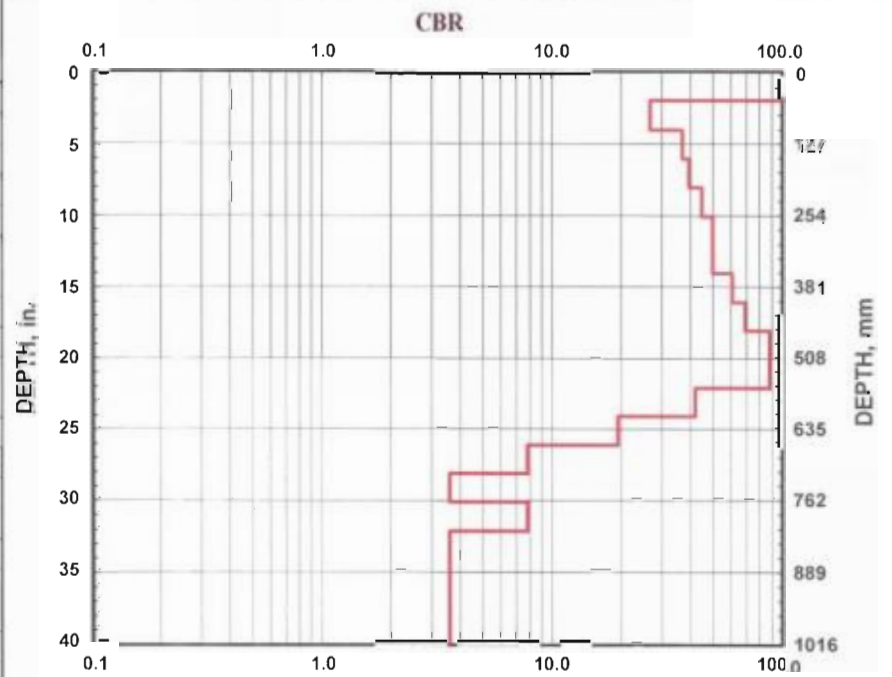
Project: Walterboro Roadways
Location: Walterboro, SC

Date: 7-Nov-12
Soil Type(s): Sand

- Hammer
- 10.1 lbs.
 - 17.6 lbs.
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
12	102	2
16	153	2
17	204	2
19	255	2
21	306	2
21	357	2
25	408	2
28	459	2
35	510	2
35	561	2
18	612	2
9	663	2
4	714	2
2	765	2
4	816	2
2	867	2
2	918	2
2	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



Based on approximate interrelations of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name: Purple Heart C-5

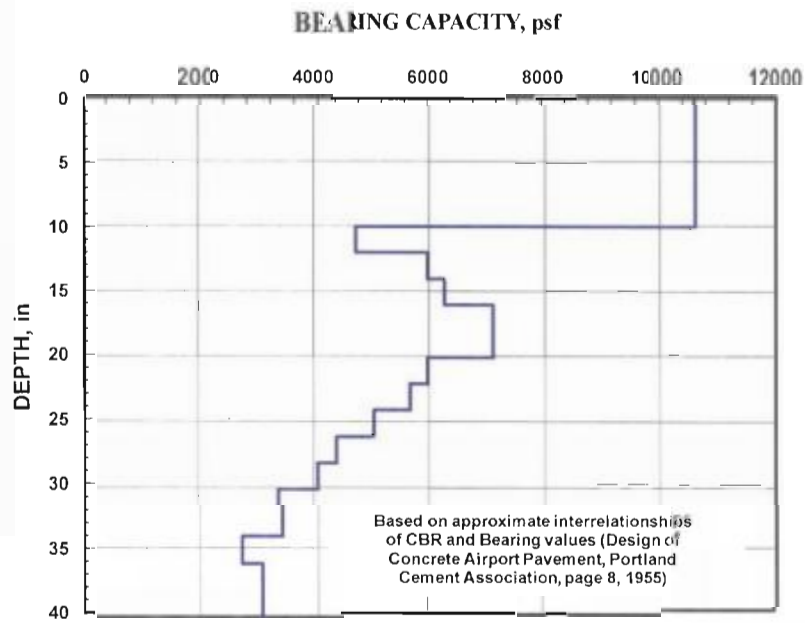
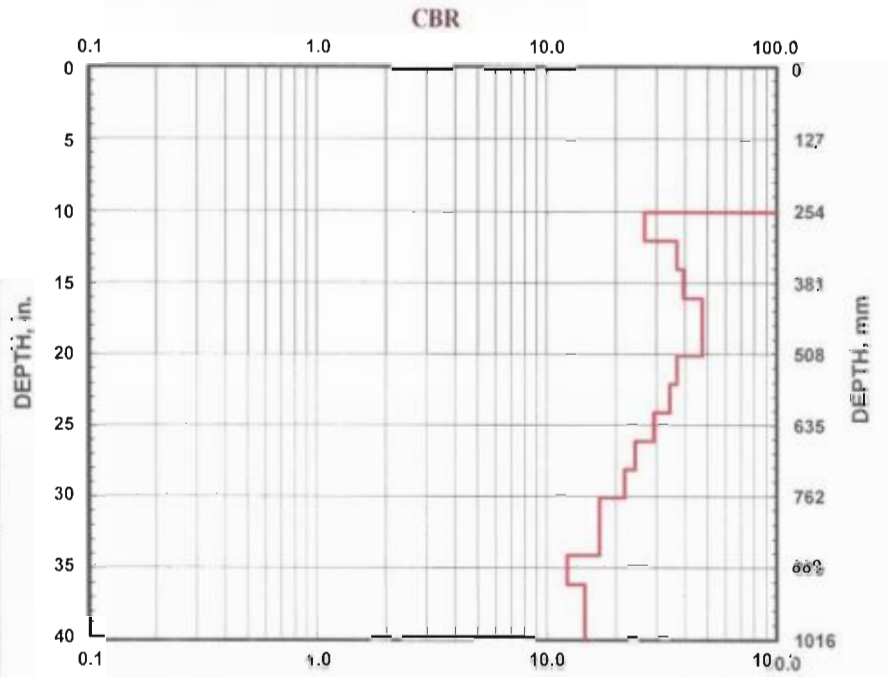
Project: Walterhorn Roadways
 Location: Walterhorn, SC

Date: 7-Nov-12
 Soil Type(s): Sand

- Hammer
- 10.1 lbs.
 - 17.6 lbs.
 - Both hammer used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
0	153	2
0	204	2
0	255	2
12	306	2
16	357	2
17	408	2
20	459	2
20	510	2
16	561	2
15	612	2
13	663	2
11	714	2
10	765	2
8	816	2
8	867	2
6	918	2
7	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name: Recreation Ln. C-1

Project: Walterboro Roadways

Date: 7-Nov-12

Location: Walterboro, SC

Soil Type(s): Sand

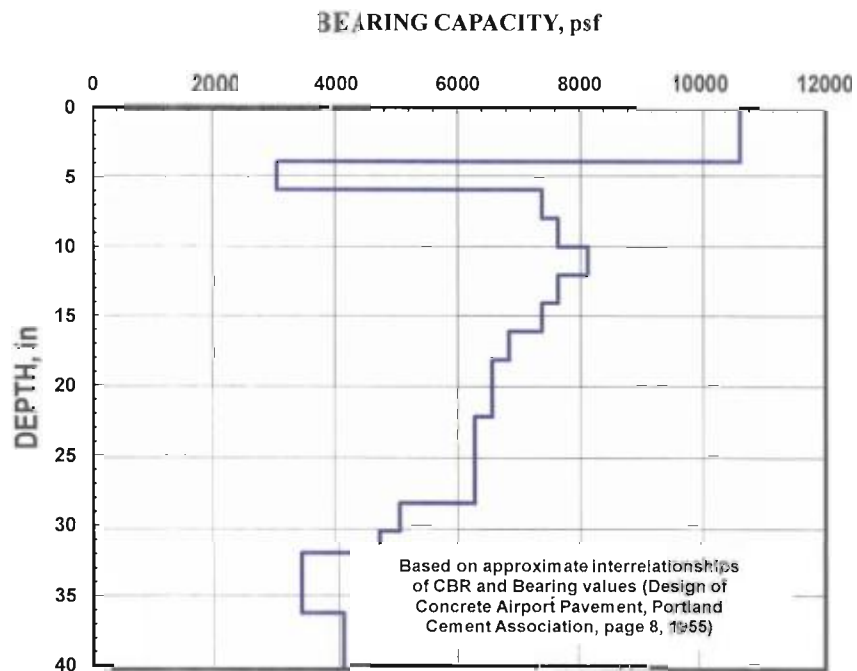
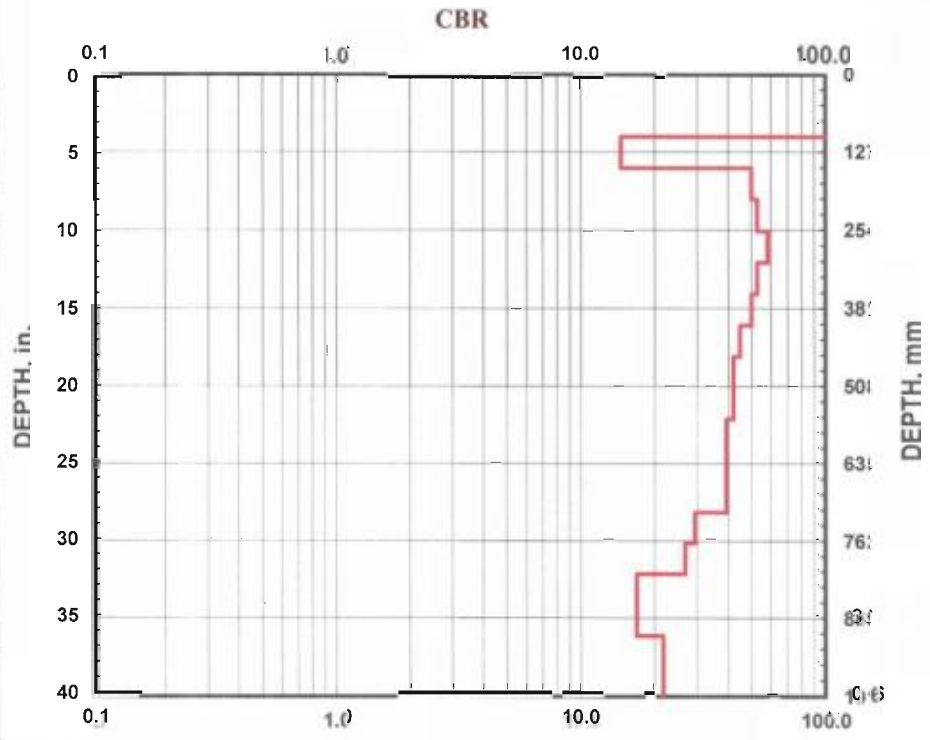
Hammer

- 10.1 lbs.
- 17.6 lbs.
- Both hammers used

Soil Type

- CH
- CL
- All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
7	153	2
21	204	2
22	255	2
24	306	2
22	357	2
21	408	2
19	459	2
18	510	2
18	561	2
17	612	2
17	663	2
17	714	2
13	765	2
12	816	2
8	867	2
8	918	2
10	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Recreation Ln. C-2

Project: Walterboro Roadways

Date: 7-Nov-12

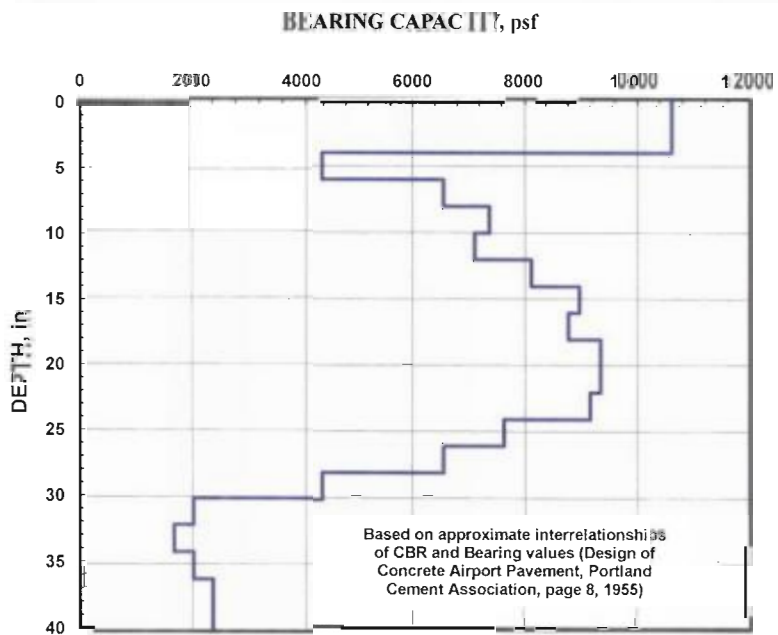
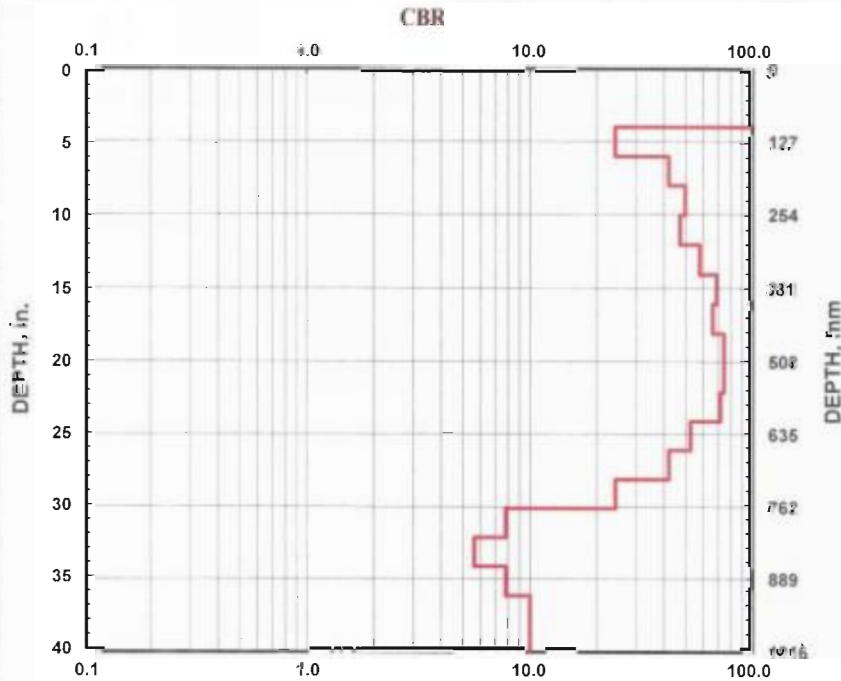
Location: Walterboro, SC

Soil Type(s): Sand

- Hammer
- 10.1 lb
 - 17.5 lb
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
11	153	2
18	204	2
21	255	2
20	306	2
24	357	2
28	408	2
27	459	2
30	510	2
30	561	2
29	612	2
22	663	2
18	714	2
11	765	2
4	816	2
3	867	2
4	918	2
5	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Recreation Ln. C-3

Project: Walterboro Roadways

Date: 7-Nov-12

Location: Walterboro, SC

Soil Type(s): Sand

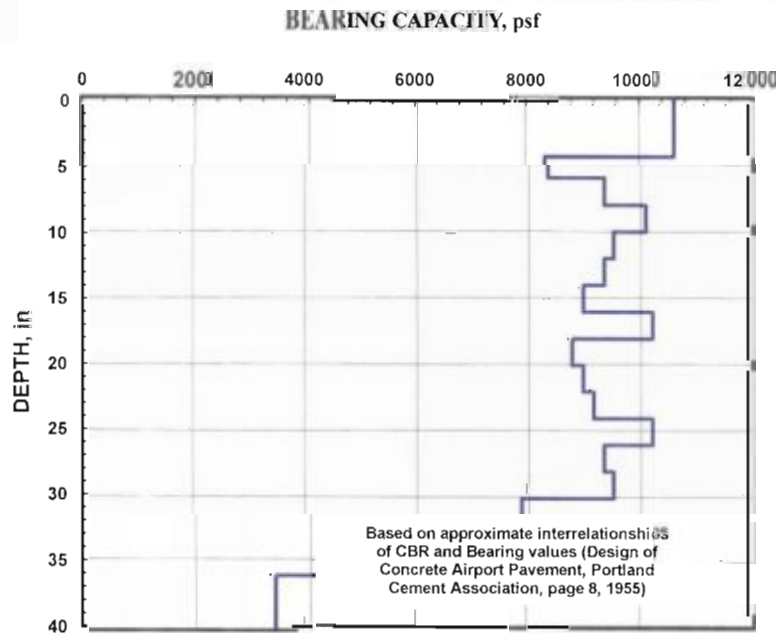
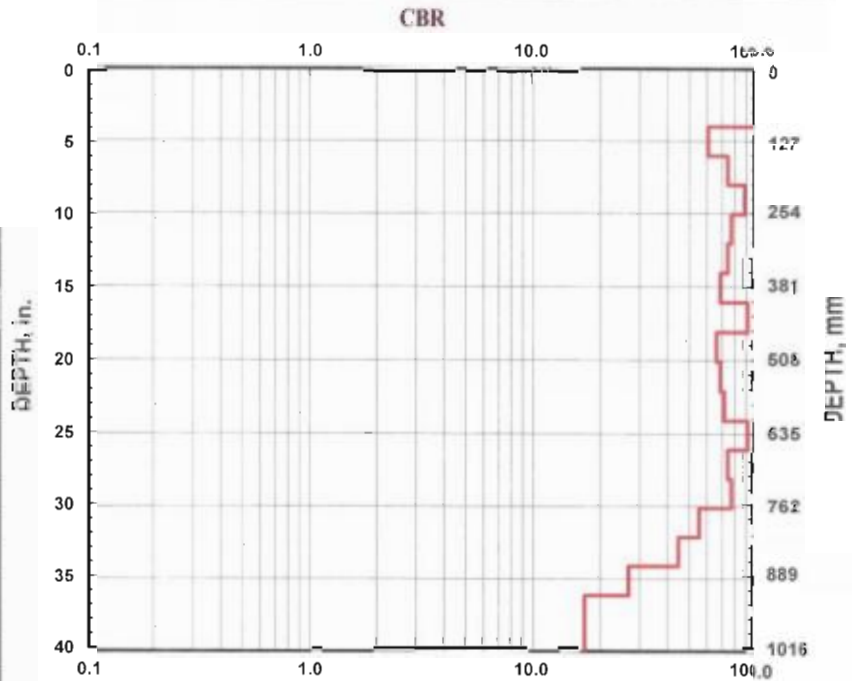
Hammer:

- 10.1 lbs
- 17.5 lbs
- Both hammers used

Soil Type:

- CH
- CL
- All other soils

Nc. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
25	154	2
30	204	2
35	255	2
31	306	2
30	357	2
28	408	2
36	459	2
27	510	2
28	561	2
29	612	2
36	663	2
30	714	2
31	765	2
23	816	2
19	867	2
12	918	2
8	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
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	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2

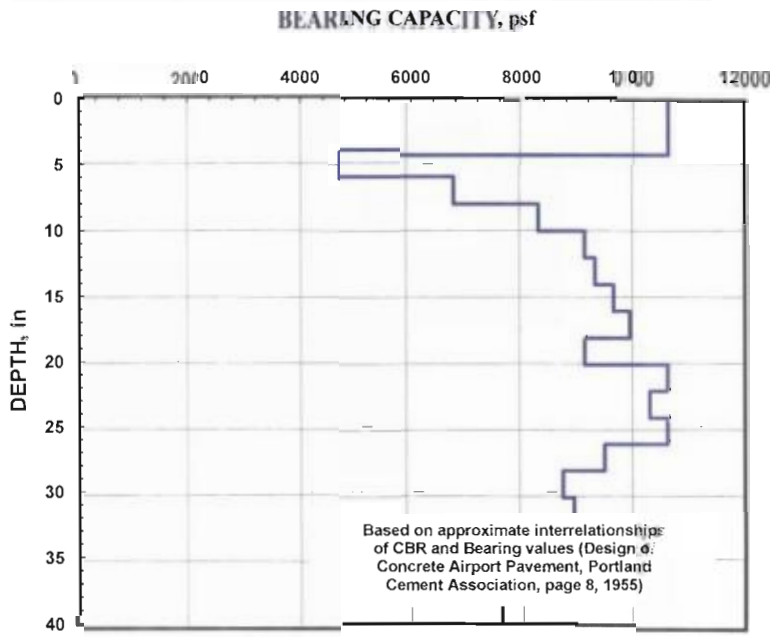
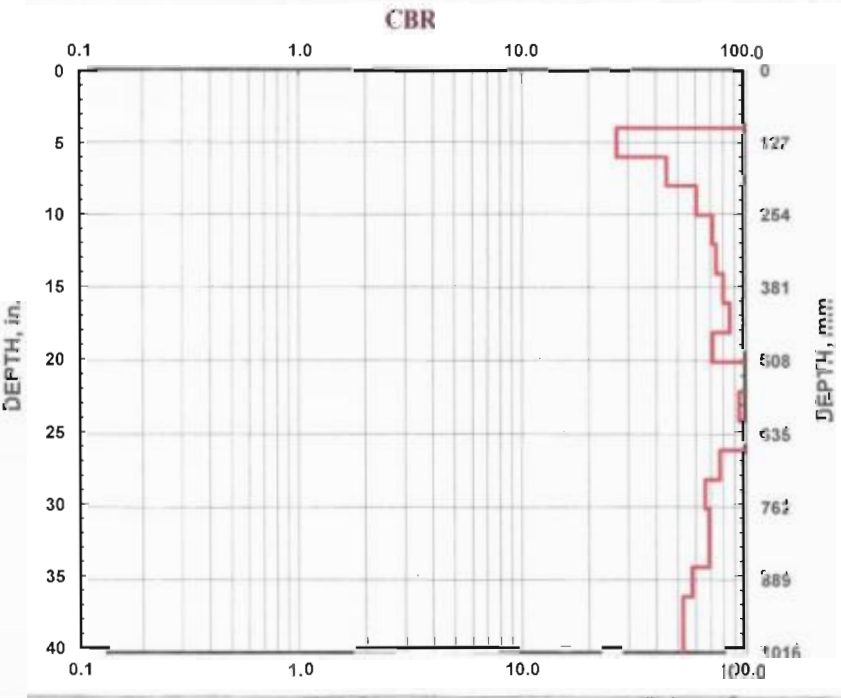


DCP TEST DATA

File Name: Recreation Ln. C-4

Project: <u>Walterboro Roadways</u>	Date: <u>7-Nov-12</u>
Location: <u>Walterboro, SC</u>	Soil Type(s): <u>Sand</u>
Hammer <input checked="" type="radio"/> 10.1 lb <input type="radio"/> 17.9 lb <input type="radio"/> Both hammers used	Soil Type <input type="radio"/> CH <input type="radio"/> CL <input checked="" type="radio"/> All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
12	153	2
19	204	2
25	255	2
29	306	2
30	357	2
32	408	2
34	459	2
29	510	2
41	561	2
37	612	2
41	663	2
51	714	2
27	765	2
28	816	2
28	867	2
24	918	2
22	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name: Recreation Ln. C-5

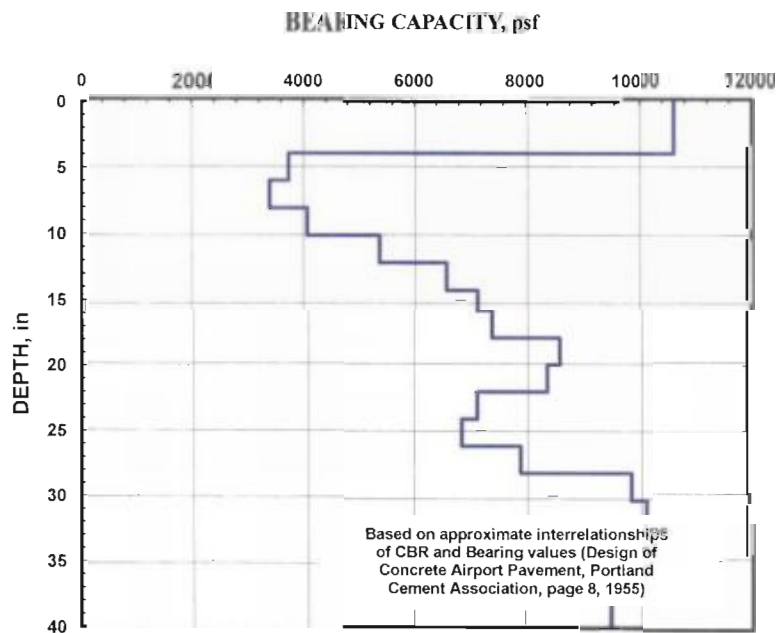
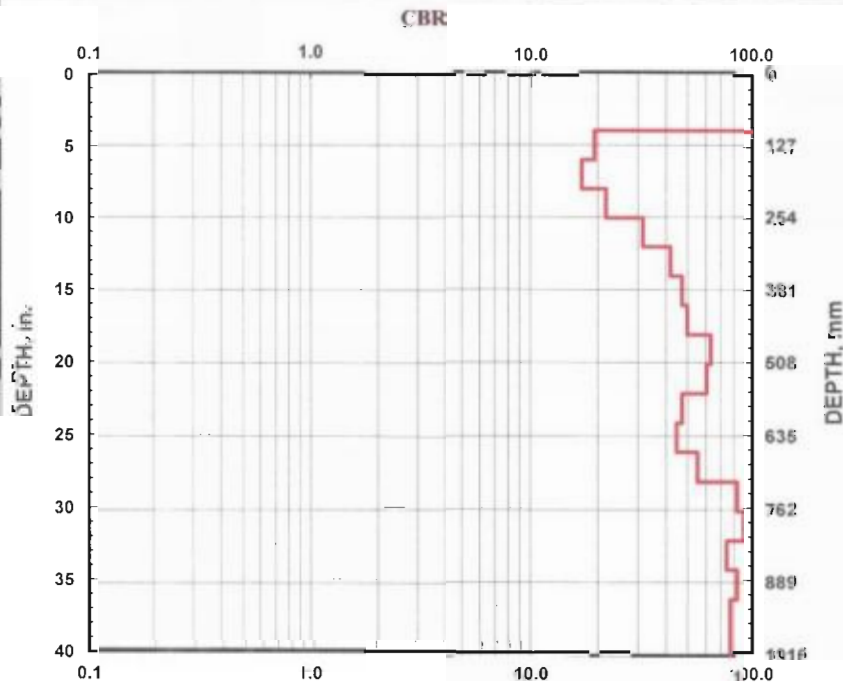
Project: Waterbury Roadways
 Location: Waterbury, SC

Date: 5-Nov-12
 Soil Type(s): Sand

Hammer
 10.1 lb
 17.5 lb
 Both hammers used

Soil Type
 CH
 CL
 All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
9	153	2
8	204	2
10	255	2
14	306	2
18	357	2
20	408	2
21	459	2
26	510	2
25	561	2
20	612	2
19	663	2
23	714	2
33	765	2
35	816	2
30	867	2
33	918	2
31	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name: Recreation Ln. C-6

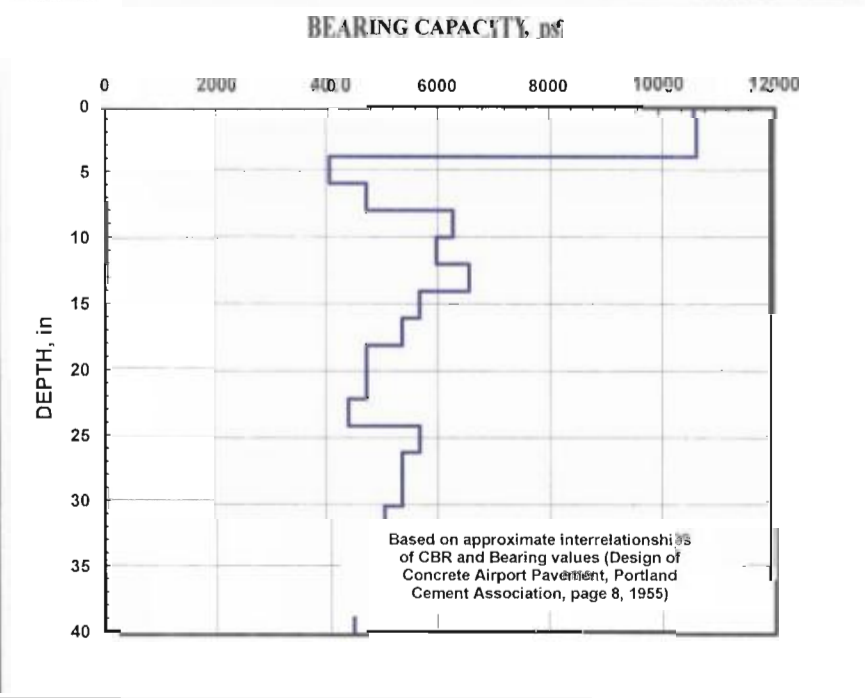
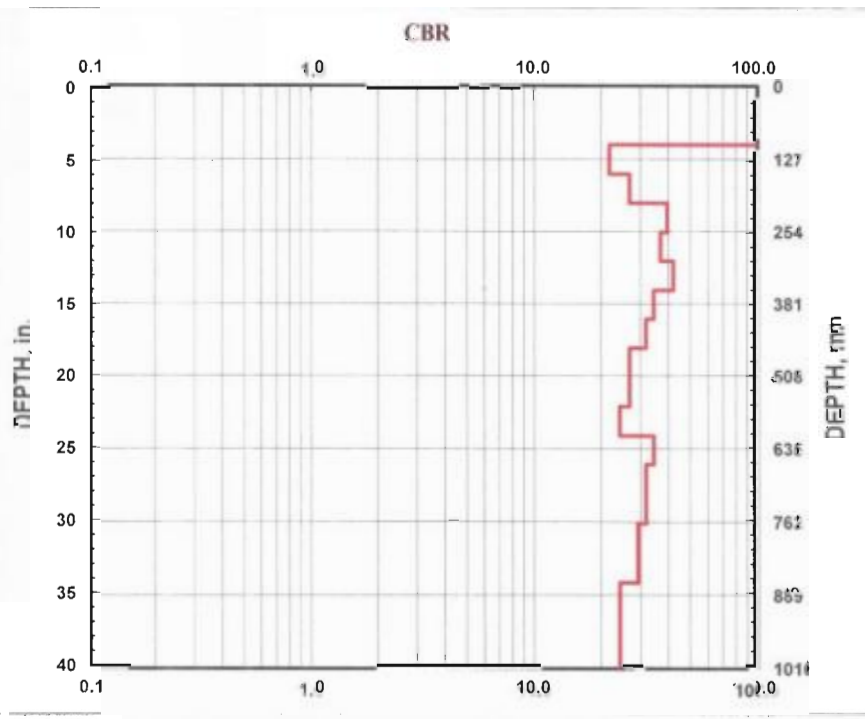
Project: Walterboro Roadways
 Location: Walterboro, SC

Date: 5-Nov-12
 Soil Type(s): Sand

Hammer:
 10.1 lbs.
 17.6 lbs.
 Both hammers used

Soil Type:
 CH
 CL
 All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
10	153	2
12	204	2
17	255	2
16	306	2
18	357	2
15	408	2
14	459	2
12	510	2
12	561	2
11	612	2
15	663	2
14	714	2
14	765	2
13	816	2
13	867	2
11	918	2
11	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Recreation Ln. C-7

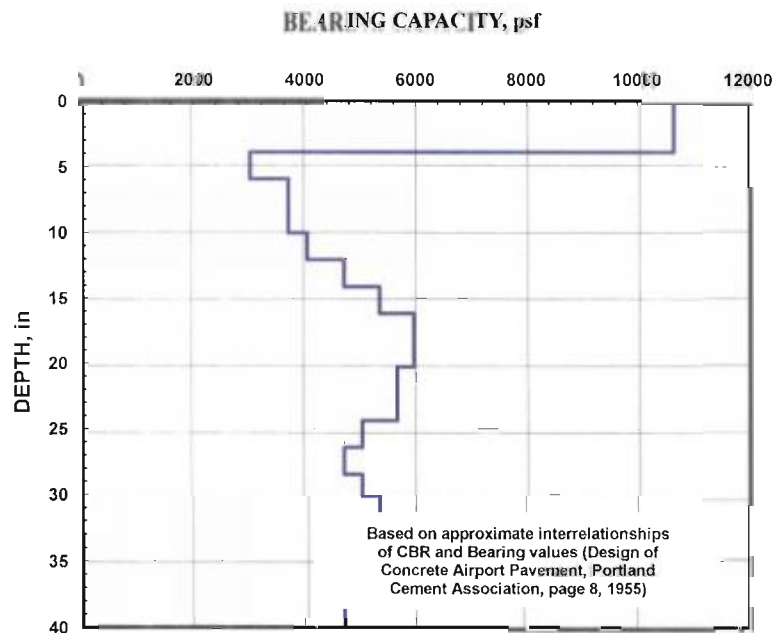
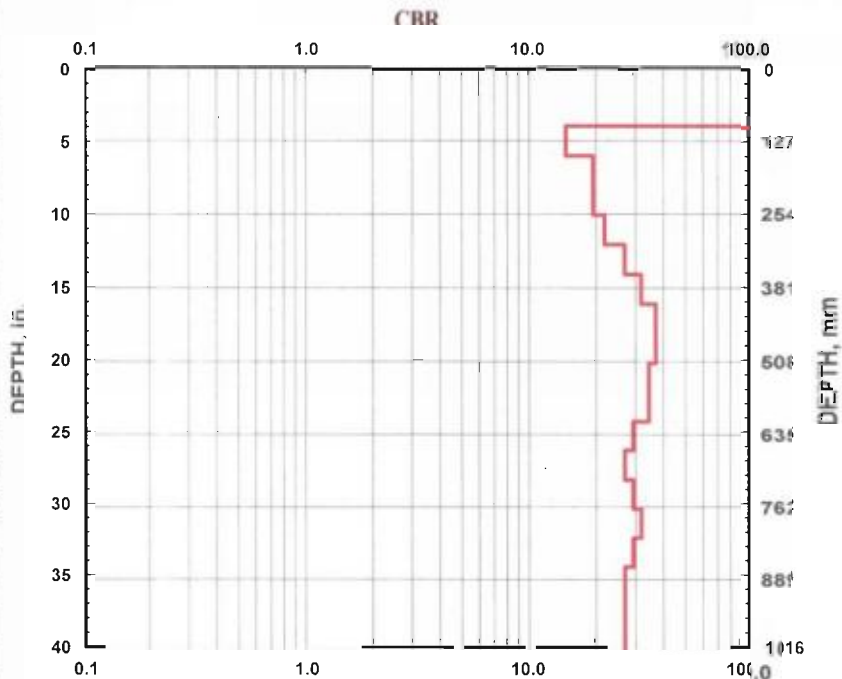
Project: Walterboro Roadways
 Location: Walterboro, SC

Date: 7-Nov-12
 Soil Type(s): Sand

- Hammer:
- 10.1 lbs.
 - 17.5 lbs.
 - Both hammers used

- Soil Type:
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
7	153	2
9	204	2
9	255	2
10	306	2
12	357	2
14	408	2
16	459	2
16	510	2
15	561	2
15	612	2
13	663	2
12	714	2
13	765	2
14	816	2
13	867	2
12	918	2
12	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name: Recreation Ln. C-9

Project: Walterboro Roadways

Date: 7-Nov-12

Location: Walterboro SC

Soil Type(s): Sand

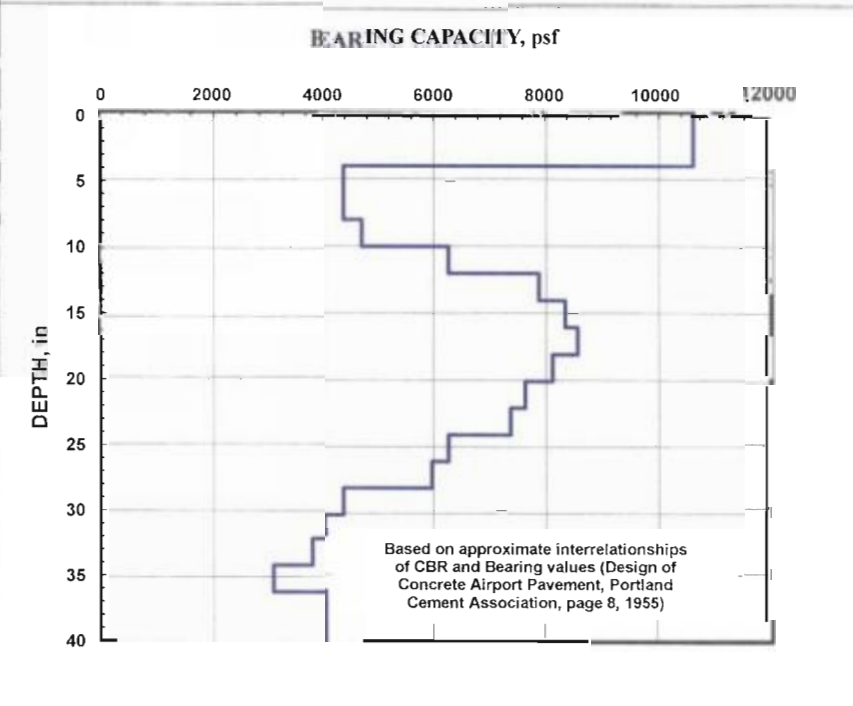
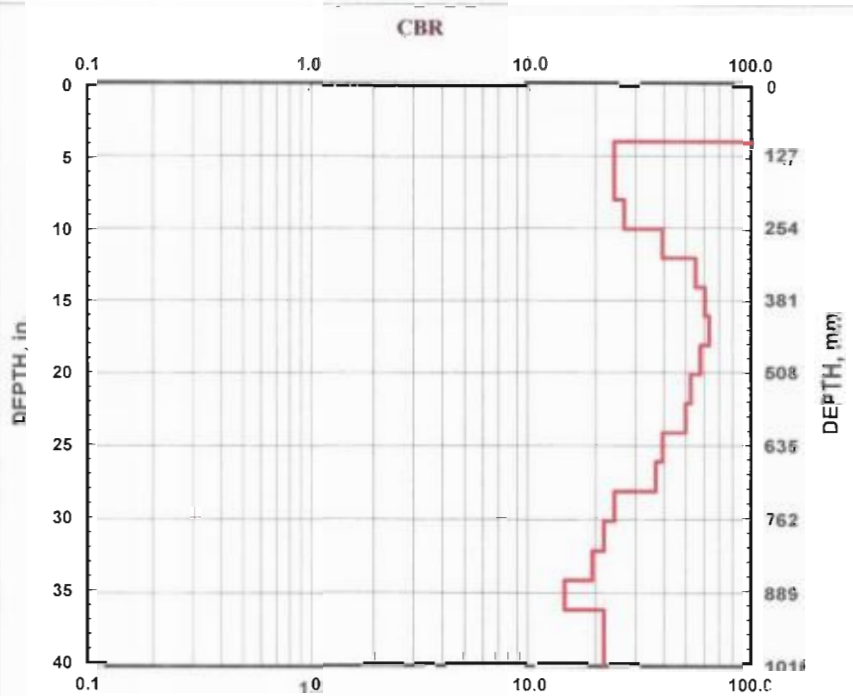
Hammer

- 10.1 lbs
- 17.6 lbs
- Both hammers used

Soil Type

- CH
- CL
- All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
11	153	2
11	204	2
12	255	2
17	306	2
23	357	2
25	408	2
26	459	2
24	510	2
22	561	2
21	612	2
17	663	2
16	714	2
11	765	2
10	816	2
9	867	2
7	918	2
10	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCPT TEST DATA

File Name: Wire Facility C-1

Project: Walterboro Roadways

Date: 5-Nov-12

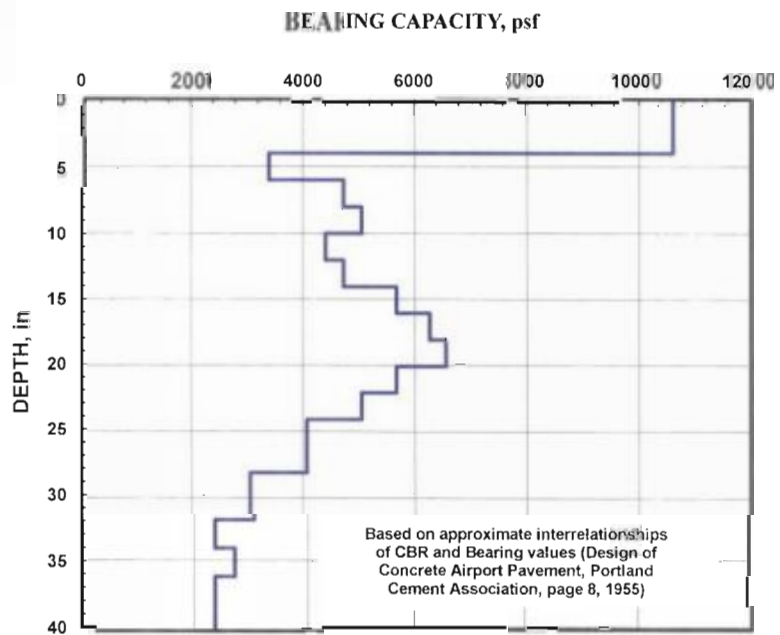
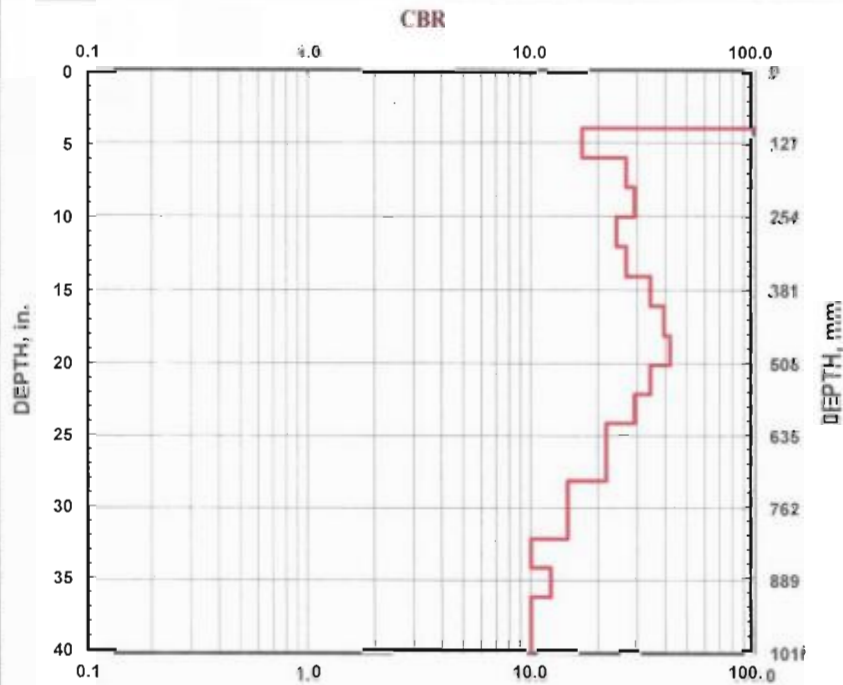
Location: Walterboro, SC

Soil Type(s): Sand

- Number
- 10.1 lbs
 - 17.5 lbs
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
8	153	2
12	204	2
13	255	2
11	306	2
12	357	2
15	408	2
17	459	2
18	510	2
15	561	2
13	612	2
10	663	2
10	714	2
7	765	2
7	816	2
5	867	2
6	918	2
5	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Wire Facility C-2

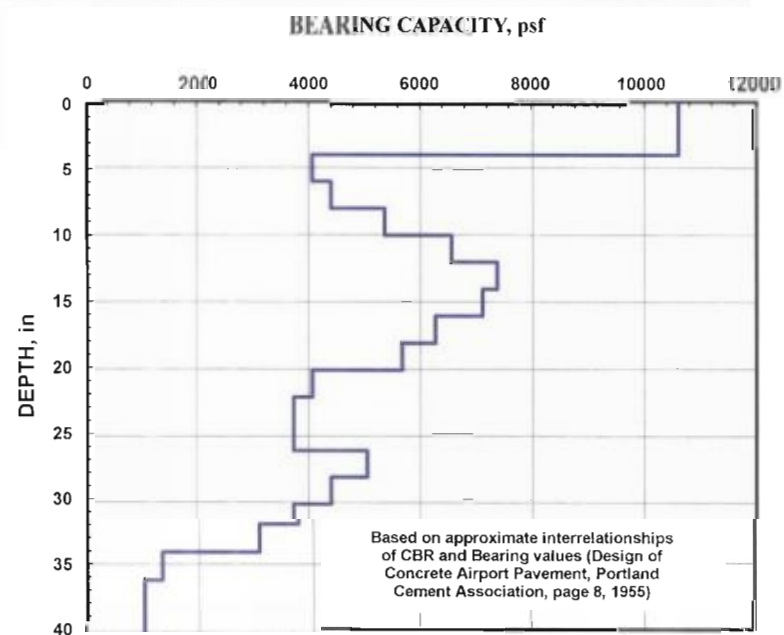
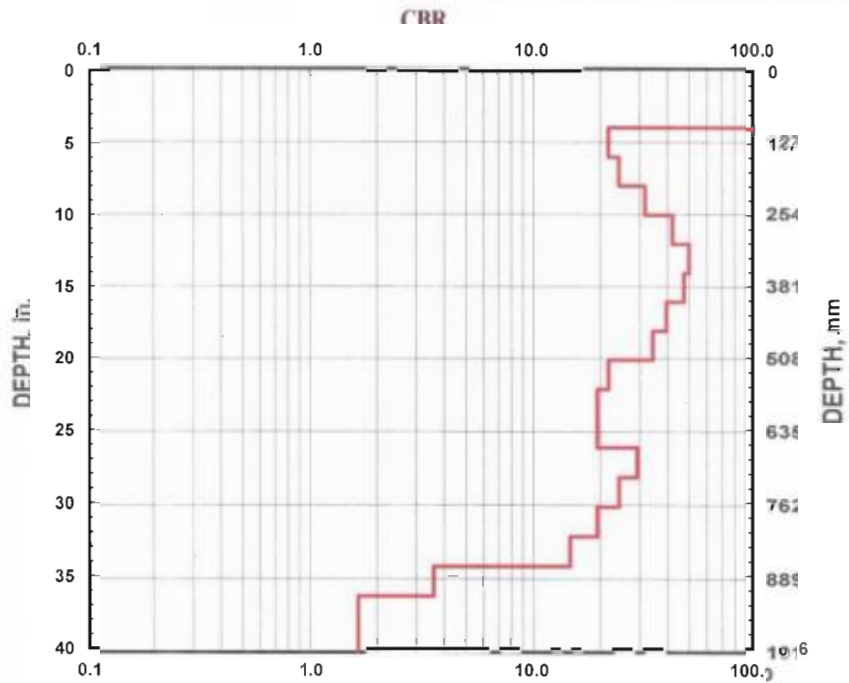
Project: Walterboro Roadways
Location: Walterboro, SC

Date: 7-Nov-12
Soil Type(s): Sand

Hammer
 10.1 lbs.
 17.5 lbs.
 Both hammers used

Soil Type
 CH
 CL
 All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
10	153	2
11	204	2
14	255	2
18	306	2
21	357	2
20	408	2
17	459	2
15	510	2
10	561	2
9	612	2
9	663	2
13	714	2
11	765	2
9	816	2
7	867	2
2	918	2
1	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



Based on approximate interrelationships of CBR and Bearing values (Design of Concrete Airport Pavement, Portland Cement Association, page 8, 1955)

DCP TEST DATA

File Name: Wire Facility C-3

Project: Walterboro Roadways

Date: 7-Nov-12

Location: Walterboro, SC

Soil Type(s): Sand

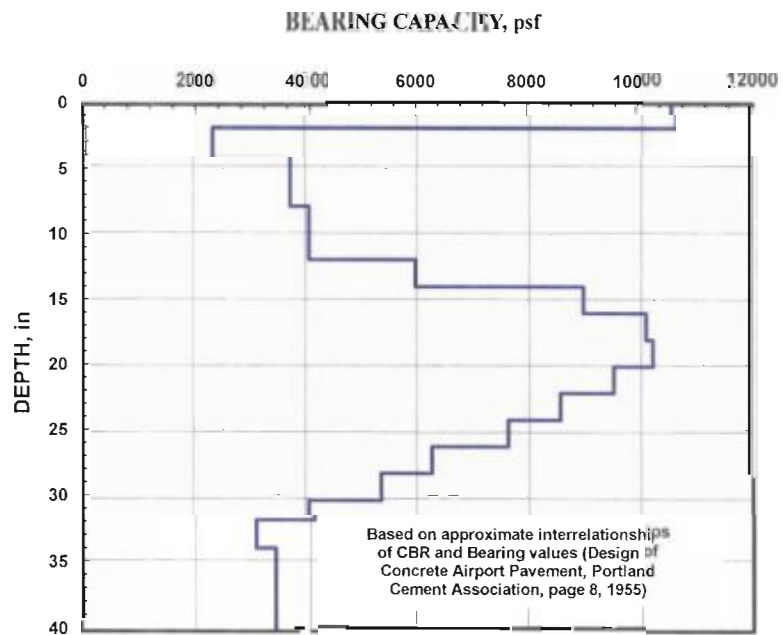
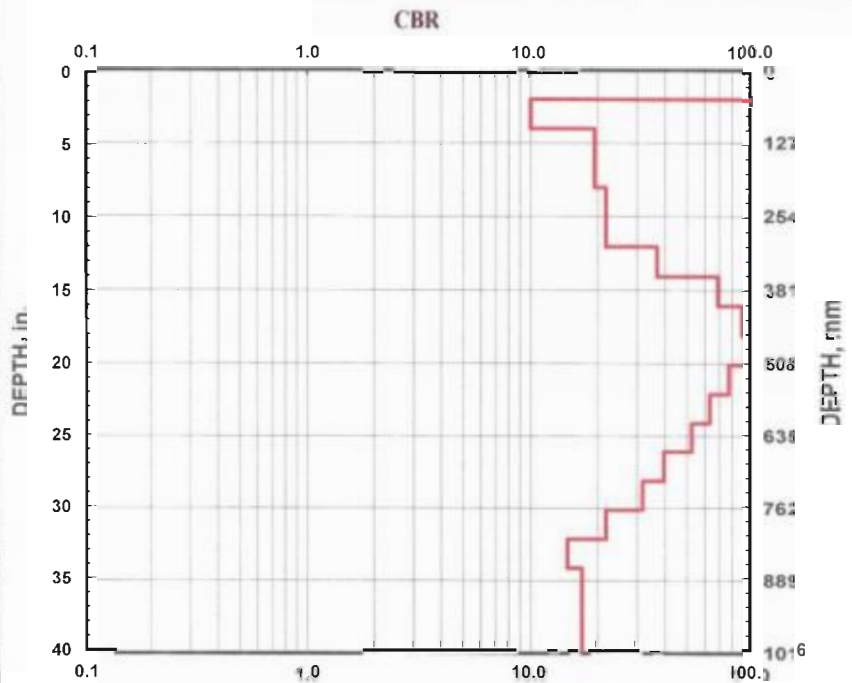
Hammer

- 10.4 lbs
- 17.4 lbs
- Both hammers used

Soil Type

- CH
- CL
- All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
5	102	2
9	153	2
9	204	2
10	255	2
10	306	2
16	357	2
28	408	2
35	459	2
36	510	2
31	561	2
26	612	2
22	663	2
17	714	2
14	765	2
10	816	2
7	867	2
8	918	2
8	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Wire Facility C-4

Project: Walterboro Roadways

Date: 5-Nov-12

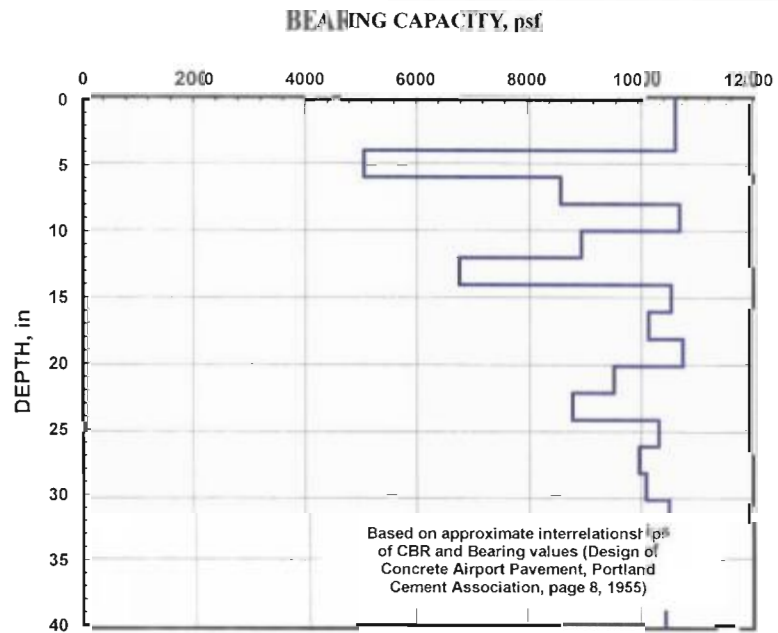
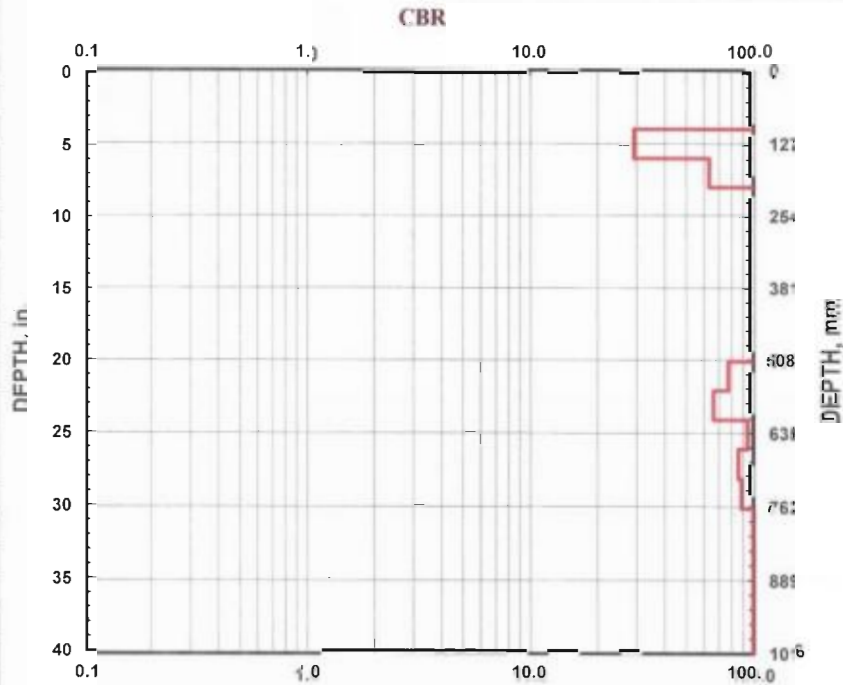
Location: Walterboro, SC

Soil Type(s): Type in the soil type

- Hammer
- 10.1 lbs
 - 17.5 lbs
 - Both hammers used

- Soil Type
- CH
 - CL
 - All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
13	153	2
26	204	2
42	255	2
63	306	2
71	357	2
52	408	2
56	459	2
48	510	2
31	561	2
27	612	2
37	663	2
34	714	2
35	765	2
39	816	2
	867	2
	918	2
	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



DCP TEST DATA

File Name: Wire Facility C-5

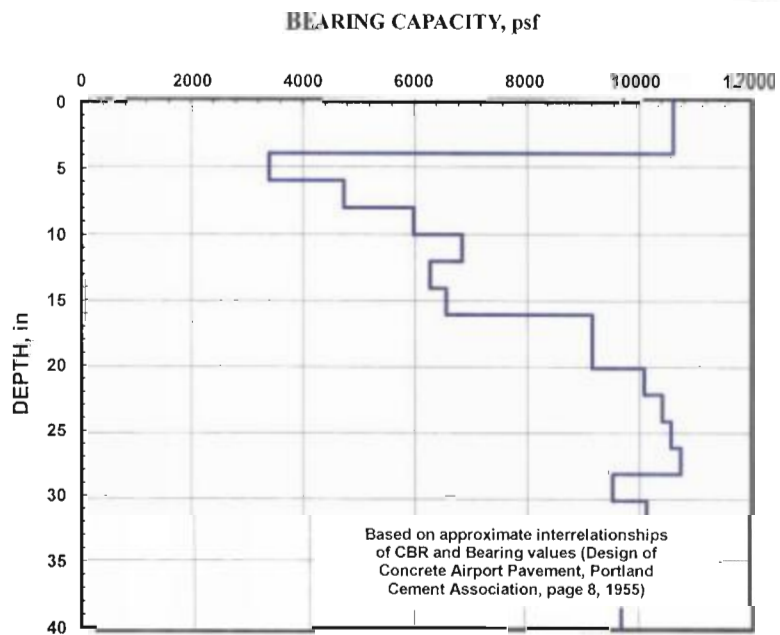
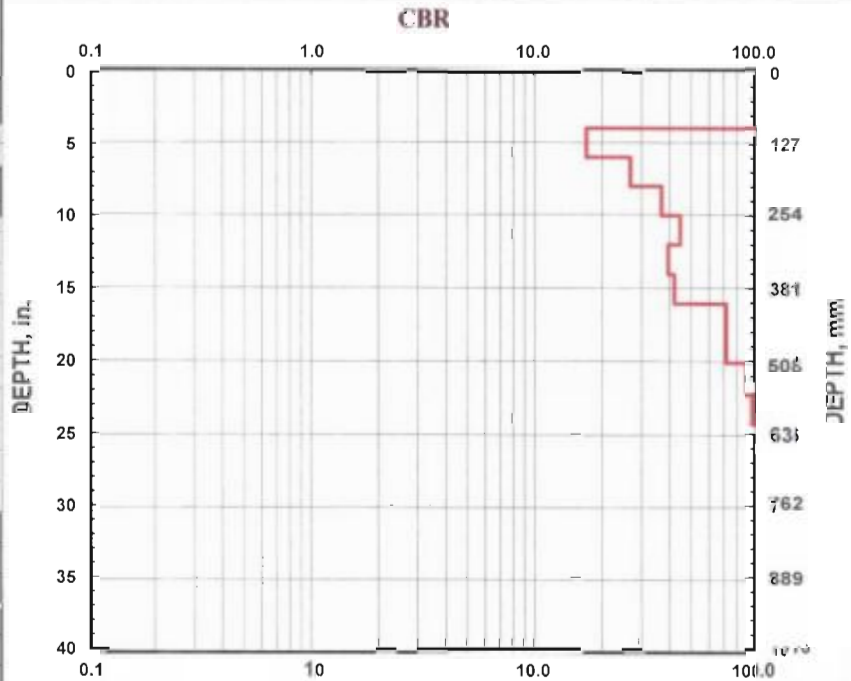
Project: Walterboro Roadways
 Location: Walterboro, SC

Date: 5-Nov-12
 Soil Type(s): Sand

Hammer
 10.1 lbs
 17.0 lbs
 Both hammers used

Soil Type
 CH
 CL
 All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	0	2
0	51	2
0	102	2
8	153	2
12	204	2
16	255	2
19	306	2
17	357	2
18	408	2
29	459	2
29	510	2
35	561	2
38	612	2
40	663	2
48	714	2
60	765	2
56	816	2
59	867	2
	918	2
	969	2
	1020	2
	1071	2
	1122	2
	1173	2
	1224	2
	1275	2
	1326	2
	1377	2
	1428	2
	1479	2
	1530	2
	1581	2
	1632	2
	1683	2
	1734	2
	1785	2
	1836	2
	1887	2
	1938	2
	1989	2
	2040	2
	2091	2
	2142	2



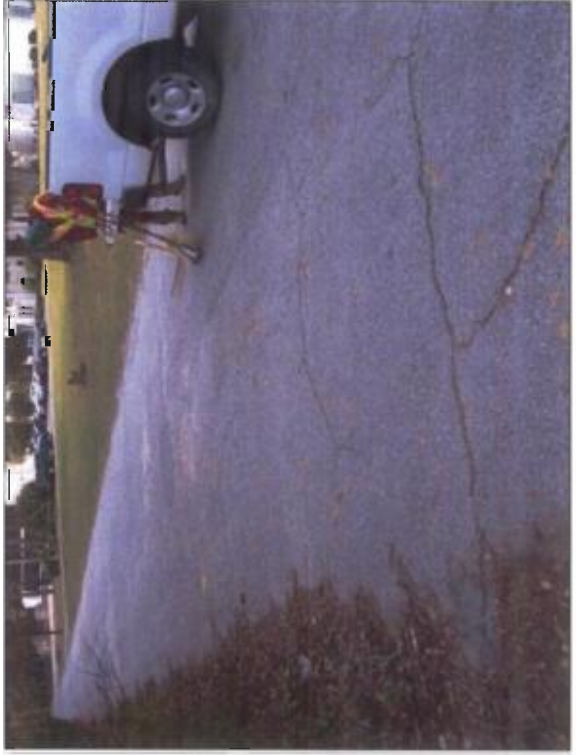
FIELD TESTING PROCEDURES

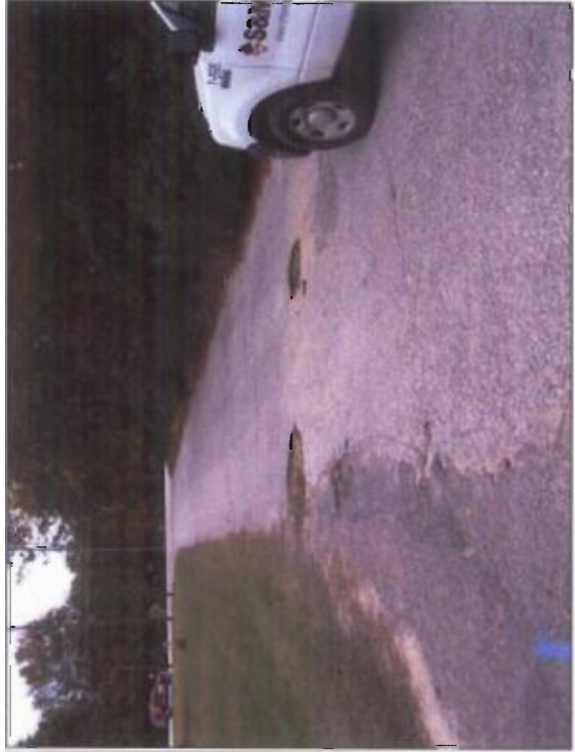
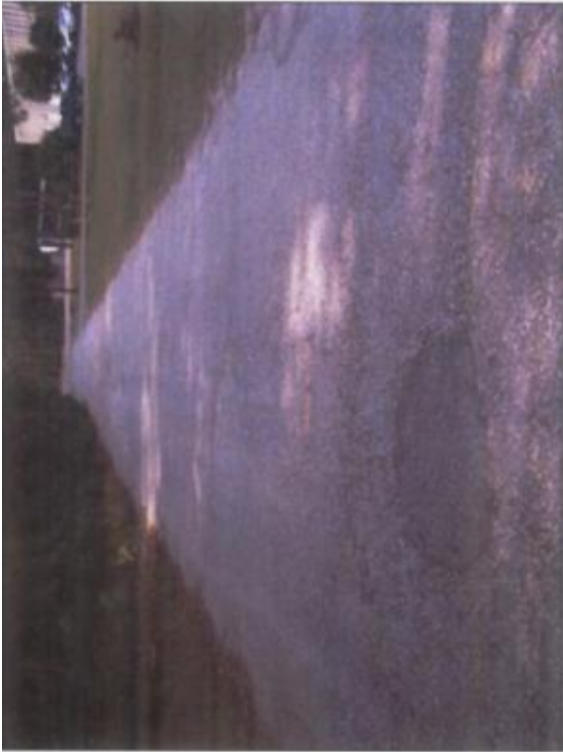
Hand-auger Borings

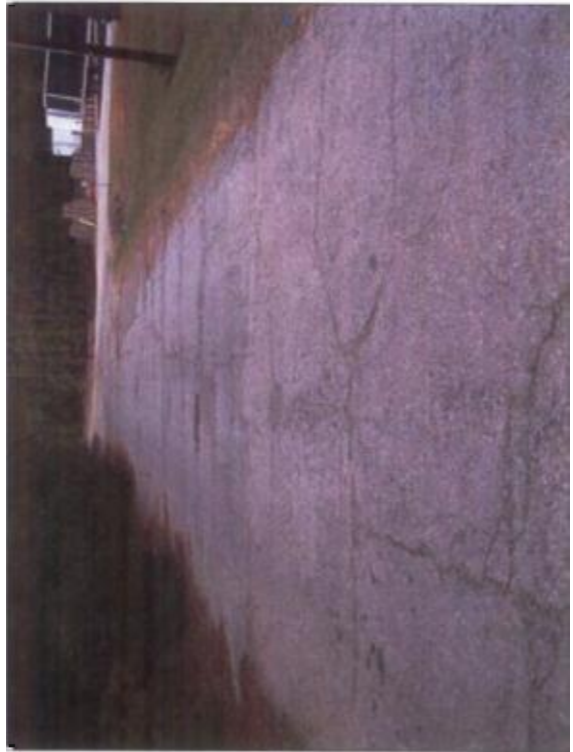
Hand-auger borings are performed by manually turning a steel auger into the ground. The soils encountered are visually classified in the field using the Unified Soil Classification System (USCS). If encountered, subsurface water level depths are measured from the existing ground surface at the time of boring. Upon completion, the bore hole is immediately backfilled with the soil cuttings.

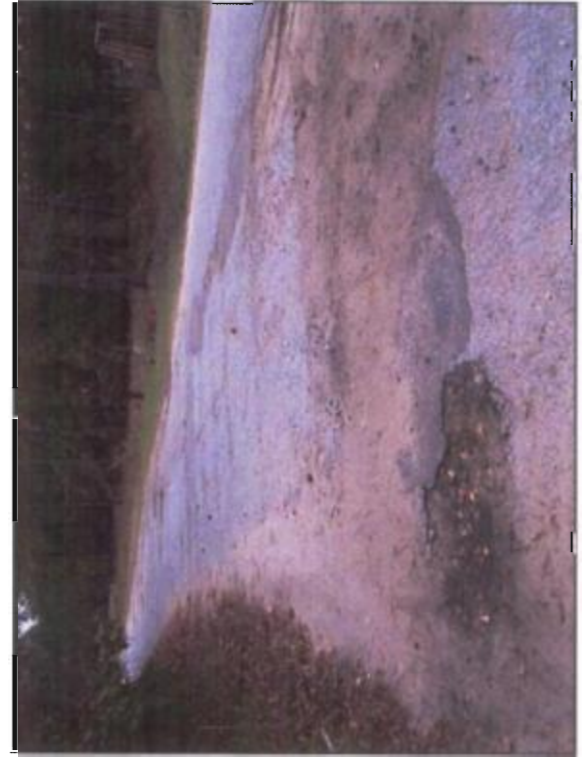
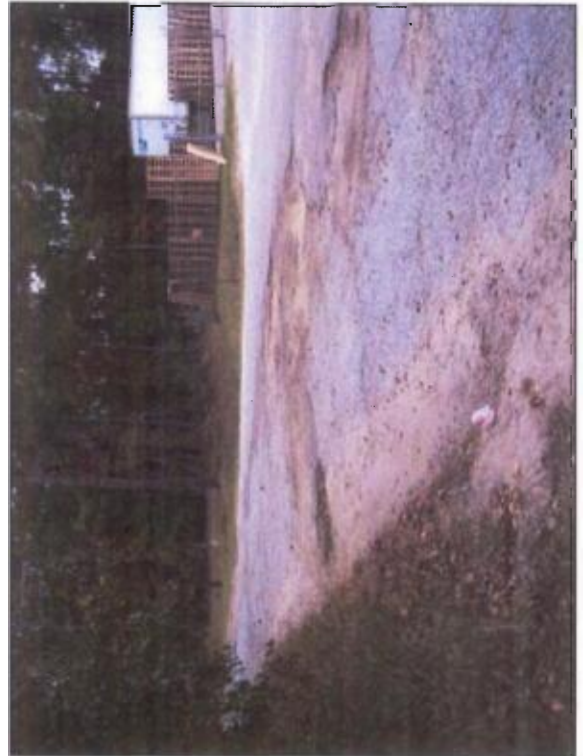
Dynamic Cone Penetrometer (DCP)

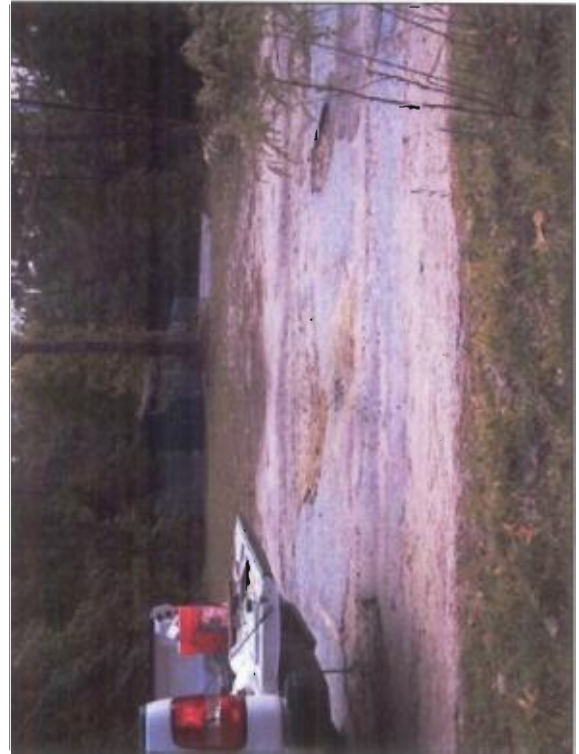
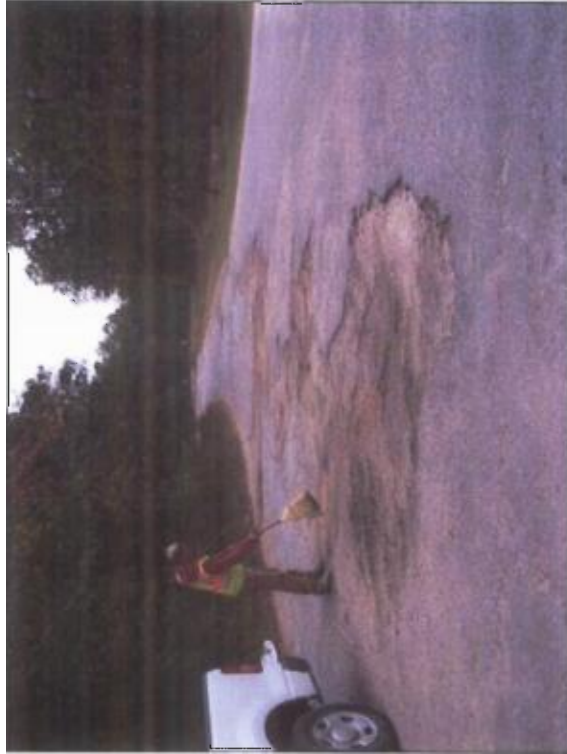
The DCP test involves driving a conical-shaped tip into the ground by use of a 10.1-pound hammer free-falling through a drop of 22.6 inches. The number of hammer blows required to drive the tip through successive increments of 2 inches is defined as the penetration index. Softer/looser soils will yield a higher Penetration Index than more dense/stiff soils. Penetration Indices can be correlated to CBR values based on extensive US Army Corps of Engineers research data.







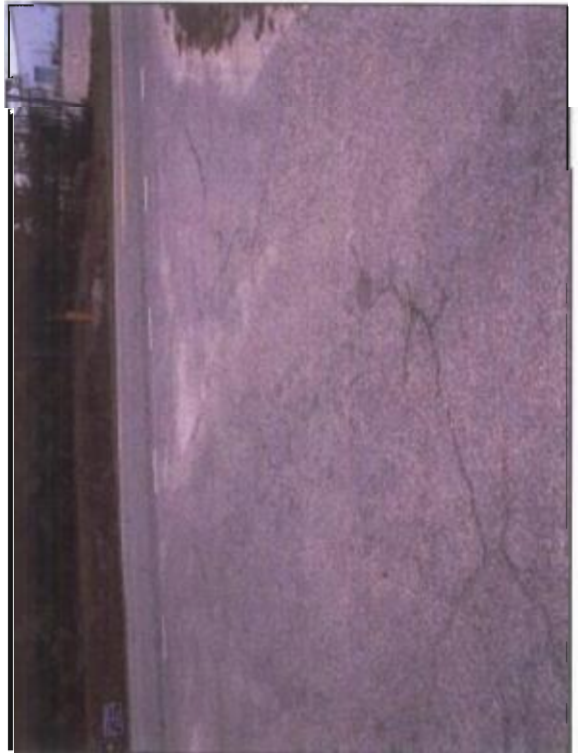
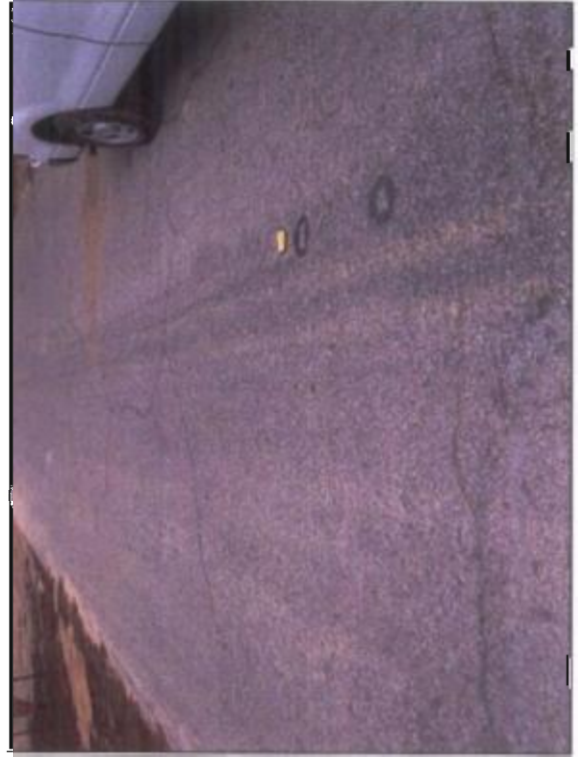


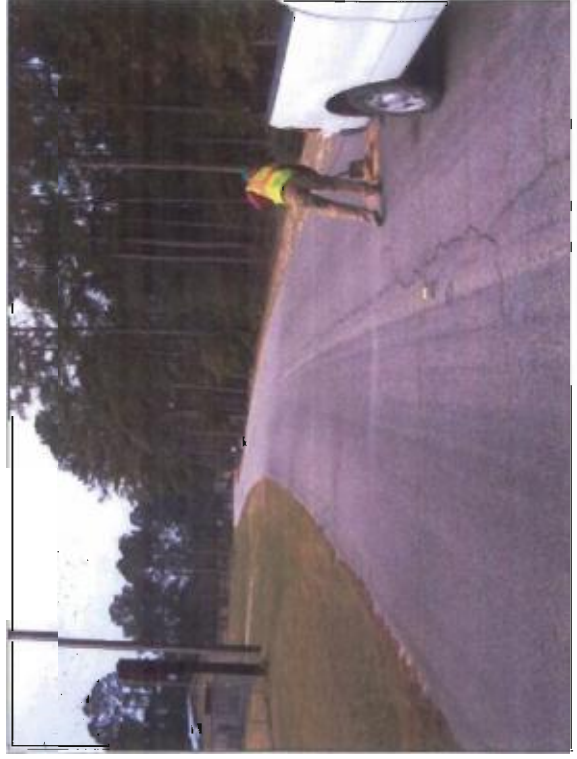




Purple Heart Drive Photographs
Walterboro Roadways / S&ME Project No. 1131-12-521
November 2012









Recreation Lane Photographs
Walterboro Roadways / S&ME Project No. 1131-12-521
November 2012

